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ÍNDICE

FLAVIO DA FONSECA — Acarological Notes XXXVII — *Schoengastia* (*Trombewingia*) *bakeri*, subg. n., sp. n., and notes on the parasitism of man by chigger mites from Brazil. (Acari, Trombiculidae) (Publicado em Maio de 1955) 1-12

P. E. VANZOLINI and L. R. GUIMARÃES — Lice and the history of South American land mammals (Publicado em Maio de 1955) . 13-46

CORNELIUS B. PHILIP — New North American Tabanidae. IX. Notes on and keys to the genus *Chrysops* Meigen (Publicado em Junho de 1955) 47-128

DALCY DE O. ALBUQUERQUE — Duas novas espécies de Hermettinae do Brasil (Diptera, Stratiomyidae) (Publicado em Junho de 1955) 129-135

JOSÉ OITICICA FILHO — Revisão dos nomes genéricos Sul-Americanos da subfamília Castniinae (Lepidoptera Castniidae) (Publicado em Junho de 1955) 137-167

DALCY DE O. ALBUQUERQUE — Nova espécie de *Bithoracochaeta* Stein. (Diptera, Muscidae) (Publicado em Julho de 1955) . . . 169-172

MAURO PEREIRA BARRETO — Sôbre a sistemática da subfamília *Phlebotominae* Rondani (Diptera, Psychodidae) (Publicado em Julho de 1955) 173-190

L. R. GILLOGLY — A review of the genus *Mystrops* Erichson (Coleoptera, Nitidulidae) (Publicado em Julho de 1955) 191-204

Rev. Brasil. Ent. 3 : 1-12 - Maio, 1955 - São Paulo

ACAROLOGICAL NOTES

XXXVII — *Schoengastia* (*Trombewingia*) *bakeri*, subg. n., sp. n., and notes on the parasitism of man by chigger mites from Brazil. (Acari, Trombiculidae).

FLAVIO DA FONSECA

Instituto Butantan, São Paulo

Of the Trombiculidae recently described, *Trombiculindus* Radford, 1948 (5) is certainly one of the most aberrant genera on account of the highly modified setae of the dorsal shield and of both sides of the uncovered idiosoma. By its filiform sensillae this genus is closely allied to the most typical Trombiculinae Ewing, Leuwenhoeckinae Womersley and Apoloniinae Wharton, approaching the first of these sub-families and *Womersia* Wharton of the last one by the unpaired antero-median seta.

Since 1941 my former assistant at the Escola Paulista de Medicina, Dr. Tuffy Haron, had observed in my collection of Trombiculidae a very aberrant species and he was invited to describe it as a n. sp. in a thesis dealing with the Brazilian Trombiculidae. As this plan could not be carried on by Dr. Haron, the new species remained undescribed for years awaiting for a new opportunity.

The need of a revision in my collection of Trombiculid mites afforded an occasion to describe this interesting chigger.

By its seven segmented three legs and the absence of stigmata and tracheae it is a Trombiculinae, sensu Wharton, 1947. It differs from Radford's *Trombiculindus* chiefly by the shape of the sensillae which are modified as in *Schoengastia* Oudemans, *Neoschoengastia* Ewing, *Euschoengastia* Ewing, *Ascoschoengastia* Ewing, *Endotrombicula* Ewing, *Doloisia* Oudemans and *Guntherana* Womersley and Heaslip. Also, the antero-lateral setae are replaced by flattened foliate scales and do not show the common hairlike appearence as in *Trombiculindus*. A minor difference is represented by the normal aspect of the setae on the ventral side of the idiosoma, where only a few foliate scales are seen. It could not be ascertained, whether the median seta of the dorsal shield is modified or not, because in all three cotypes examined it was broken; the remaining

implantation mark, however, seems to be one of a normal shaped seta or perhaps a transition to a foliate one, as it is sometimes the case for some of the abdominal setae.

The species under discussion is also allied to *Neoschoengastia* Ewing (= *Paraschoengastia* Womersley) by the shape of the sensillae, by the one toothed mandible, by the trifurcate palpal prongs, as also by the distribution of the scutal setae. Nevertheless, it shows no imbedded podosomatal scutum, a character that Wharton uses to consider of primordial importance in the characterisation of this genus (1).

In Womersley's key of genera and subgenera (1952) this species would run to the subgenus *Ascoschoengastia* Ewing, 1945, of the genus *Schoengastia* Oudemans, 1910, on acount of his trifurcate palpal claw instead of the 5-7 palpal prongs of *Euschoengastia* Ewing, 1938.

The new species is as closely allied to *Ascoschoengastia* Ewing. As *Trombiculindus* is allied to *Trombicula* Berlese, both approaching each other merely by a phenomenon of convergent adaptation, perhaps with the finality of a better protection of the idiosoma. In other words, *Trombiculindus* is, with little difference a *Trombicula* and the new species is, "mutatis mutandis", an *Ascoschoengastia*, both masked by a foliate coverture.

Womersley in 1952 (11) denies any generic value to the foliate aspect of the setae, as this modification is common to many families of *Acari* including, of course, Trombiculidae and he drops *Trombiculindus* to the synonymy of *Trombicula*.

As a matter of fact, the occurrence of somewhat foliate setae in Trombiculidae is not a recent discovery, as it has been reported in the oriental region in some species of *Ascoschoengastia* Ewing, 1938 (syn: *Neoschoengastia* Ewing, 1929, "pro parte"), such as *A. foliata* (Gunther), *A. macculochi* (Womersley), *A. pseudomys* (Womersley) and *A. uromys* (Womersley et Kohls) (11, 12).

Wharton et al. (10) and Jameson and Sasa (3) mantain *Trombiculindus* as a subgenus of *Trombicula*, including *T. squamosus* Radford, *T. cuneatus* Traub and Evans, *T. foliaceus* Traub and Evans, *T. squamiferus* Womersley and *T. kansai* Jameson and Sasa.

A transitional aspect of the setae can be found also in the following species of the genus *Trombicula*: *T. parapalpalis* Womersley, *T. fordi* Laurence, *T. puta* Womersley, *T. traubi* Womersley and *T. hastata* (Gater).

The same modification is observed in *Tecomatlna melvini* (Traub et Evans) and in *Leuvenhoekia womersleyi* Lawrence.

The occurence of such a modification of the setae in at least three different genera seems to afford an argument favoring the

subdivision in subgenera, since this character represents a natural tendency of some members of the same family.

As no adults of the species of *Ascoschoengastia* with foliate setae in the larvae are known it seems unwise to include the oriental species in the same subgenus with the neotropic one.

Trombewingia, subg. n.

With all characters of the genus *Euschoengastia* Ewing, 1938 (sensu Wharton et al., 1951) and of the subgenus *Ascoschoengastia* Ewing, 1945 (sensu Womersley, 1952) but presenting a coverture of foliate dorsal scutal setae. Subgenotype, the following species:

Schoengastia bakeri, n. sp.

Trombiculinae, "sensu" Wharton 1947, *Schoengastia* Oudem., 1910. Podosomatal dorsal scutum not imbedded in the integument, bearing five appendages besides the sensillae, of which one median anterodorsal, two antero lateral and two postero- or mediolateral, the paired ones being foliate. Sensillae clavate, almost circular in outline. Eyes present. Palpal prongs trifurcate. Mandibles with two short dorsal and ventral teeth. Idiosoma with foliate scales and normal shaped barbed setae.

Total length 365-514 micra by 160-293 micra greatest width. Colour of mounted specimens deep orange. Idiosoma regularly elliptical in outline.

Gnathosoma 70 micra. Palps angulate; femoral seta dorsolateral, barbed; genual seta dorsal, barbed, not represented in the figure 6; ventral and lateral tibial setae barbed; tibial seta simple. Palpal thumb with 4 barbed setae and a spur. Palpal claws trifurcate with two external, weaker, accessory, and one internal, axial, stronger, prongs. Maxillicoxae with a long galeal seta on each side. Mandible, so far as could be seen, with only two short teeth, one dorsal and one ventral.

Idiosoma — Podosomatal scutum 45,8-56,8 micra long, more or less rectangular, with prominant anterior corners and therefore with concave anterior margin, 66-80 micra wide; lateral margins irregular, convex, salient at the level of the implantation of mediolateral appendages; posterior margin 73,5-84,5 wide, slightly concave with blunt postero-lateral angles. Surface deeply punctated from the level of the sensillary implantation to the anterior and lateral margins; only slightly punctated on the median half and without punctations on the median posterior one. Two ridges are seen in front of the implantation of the sensillae. Sensillary basis large, bearing broad spatulate sensillae 33 micra long, measured from the basis, with spined surface. Antero-lateral setae replaced

by long foliate structures, 36,7-40,0 micra long by 12 micra wide (which have some small hairs at the proximal end and a spinous surface), implanted directly on the antero-lateral corners and attaining the sensillary basis when directed posteriorly. Postero-lateral setae replaced by similar but still longer, 84,5-90,5 micra long by 14 micra wide, foliate structures, curiously displaced to a level immediatly in front of the sensillary basis and causing a salience of the lateral margins. The shape of the antero-median structure, perhaps a transition from a set to a foliate organ, as it types; the sub-marginal implantation, however, is by no means as large as those of the lateral structures, denouncing a much reduced structure, perhaps a transition from a setae to a foliate organ, as it

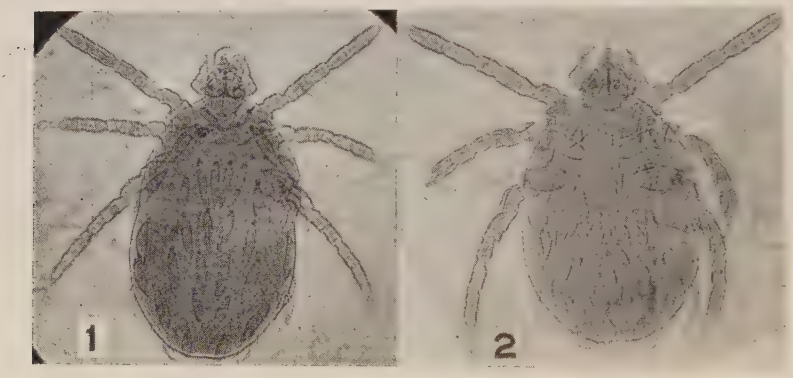

Fig. 1 — *Schoengastia* (*Trombewingia*) *bakeri*, dorsal side.
Fig. 2 — *S.* (*T.*) *bakeri*, ventral side.

is the case with some setae of the uncovered integument. Standard data from a smaller and a larger cotype, after Womersley and Heaslip, 1943: AW = 68-77 micra — PW = 82-91,5 micra — SB = 25,5-33 micra — ASB = 27-36,7 micra — PSB = 19,7-24 micra — AP = 25,5-29,5 micra — AL = 36,6-40,5 micra — PL (1) = 73,5-84,5 micra — S (2) = 33 micra. Anterior and posterior eyes clearly visible at the level of the pseudostigmata.

Uncovered dorsal surface. Integument striated. Only large foliate setae with an acute posterior end are seen replacing the habitual setae, all showing seven to twelve longitudinal series of denticular structures. The first dorsal external of the first row is the largest, 80,8-88,4 micra; humerals 40,5-66 micra; only the two posterior paramedian pairs are shorter, about 33-43 micra by 13

(1) Medio-lateral in the present case.
(2) Present on only one side of the specimen.

micra, the posterior one blunt. The number observed was constant in the three cotypes, all showing 32 elements. They were always disposed according to the same pattern: 2:8:6:6:6:4. Two of these (which have some small hairs at the proximal end and a spinous surface), implanted directly on the antero-lateral corners and attaining the sensillary basis when directed posteriorly. Posteroscales of the two last rows are marginal and the integument is not completely covered as in *Trombiculindus* Radford, at least in partially engorged specimens.

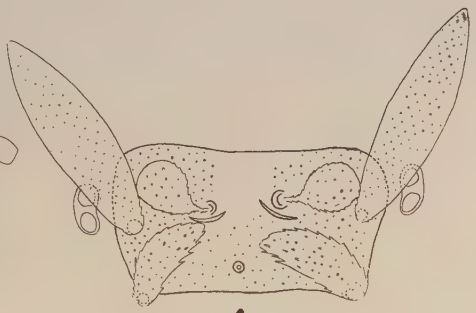

Fig. 3 — *S.* (*T.*) *bakeri,* dorsal side.
Fig. 4 — *S.* (*T.*) *bakeri,* podosomatal plate.

Ventral surface. Things are much more complicated on the ventral side, where foliate structures are seen together with normal setae. The number of both varies slightly as do also their situation. Even in the same specimen the nunber of setae as also of foliate structures can be different on each side. Besides the two constant pairs of normal sternal setae, there is a constant anterior row of 4 to 6 elements on each side; of these all twelve are true setae in specimen *b*; in specimen *a* six are setae on each side, but a seventh element of foliate character is present on the right side; in specimen *c* this row is formed by five elements on the right, and six on the left, the external one being a narrow foliate element. The second row is formed by two sub-median setae. A third row of two submedian setae is present on cotype *c,* only the right one being visible in cotype *b,* this row being absent in cotype *a*. The fourth

row is formed by 2 to 3 normal setae and two narrow foliate ones on each side. A pair of submedian setae in front of the anal orifice is visible in specimen *c*, two other such pairs flanking the anus are present in all cotypes. The size of these normal setae varies from 22 to 40 micra. Besides these setae there are 2 to 4 pairs of foliate

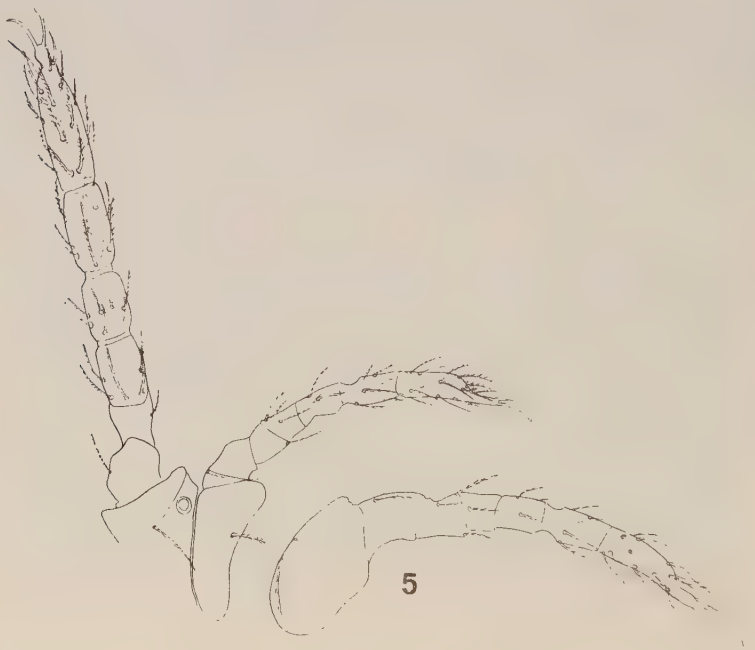

Fig. 5 — *S.* (*T.*) *bakeri*, legs.

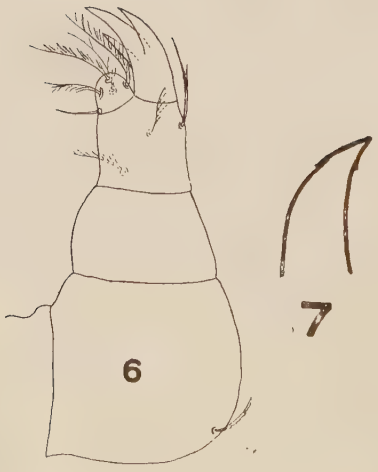

Fig. 6 — *S.* (*T.*) *bakeri*, palp.
Fig. 7 — *S.* (*T.*) *bakeri*, mandible.

posterior elements, 30-55 micra long, the more posterior pair always shorter and with a blunter end.

It is noteworthy that some of the elements of the ventral side are clearly of a transitional character between common setae and foliate elements. It could be observed in these cases that the spine-like rows seen on the broader foliate structures are nothing more than the distended barbs of common corn-like setae. These transitional elements are 34-48 micra long.

No instance of this species occuring on human beings was reported in spite of the fact that laboratory workers of our staff frequently spent the whole day at the same places where infected *Guerlinguetus* had been found. The above description is based on three cotypes caught by myself on the common south-Brazilian squirrel, "Serelepe", *Guerlinguetus ingrami ingrami,* in the reserve forest of the Horto Florestal de São Paulo, in the neighbourhood of São Paulo city, on 1-VIII-1935. Three cotypes, N.° 344, in the collection of the Escola Paulista de Medicina, São Paulo, mounted in modified Berlese's fluid.

COMMENTS ON THE CHIGGER MITES OF BRAZIL AND ON THE PARASITISM OF HUMAN BEINGS BY *APOLLONIA TIGIPIOENSIS*

At the time Ewing started his work on Trombiculid mites there were known only some eight genera in this group as it is now understood. The considerable amount of information regarding the taxonomy of larval chiggers has brought up this number to about 40. The main contributor to this figure was Ewing to whom some 17 of these genera are ascribed. The number of species already known is not far from four hundred; one hundred and fourty-two, included in fourteen genera have been cataloged by Radford in 1942 (5) and two hundred and sixty by Womersley in 1952 (11).

In Brasil eighteen species are known distributed in eight genera and subgenera. In 1949 Jenkins (4) published his excellent review of the *Eutrombicula* of the American hemisphere, dropping in synonymy *E. brasiliensis* and *E. butantanensis.* To date the valid species of chiggers of Brazil are the following ones: (1)

1. *Apollonia tigipioensis* Torres et Braga, 1938.
2. *Euschoengastia* (*E.*) *brasiliensis* (Fonseca, 1935).
3. *Euschoengastia* (*E.*) *trouessarti* (Oudemans, 1910).
4. *Trombicula* (*Eutrombicula*) *alfreddugèsi* Oudemans, 1910, syn: *Trombicula butantanensis* Fonseca, 1932; *T. irritans* (Riley, 1873); *T. irritans uruguayensis* André, 1930; *T. vanommeremi* (Schierbeck, 1937), etc.

(1) For complete synonymy see Jenkins ("loc. cit.").

5. *Trombicula* (*Eutrombicula*) *batatas* (Lin., 1758), syn.: *Trombicula brasiliensis* Ewing, 1925; *Eutrombicula brasiliensis* (Ewing, 1925); *Trombicula pastorae* Boshell et Kerr, 1942; etc.
6. *Trombicula* (*Eutrombicula*) *goeldii* Oudemans, 1910.
7. *Trombicula* (*Eutrombicula*) *bruyanti* Oudemans, 1910.
8. *Trombicula* (*Eutrombicula*) *ophidica* Fonseca, 1932.
9. *Trombicula* (*Eutrombicula*) *tinami* Oudemans, 1910.
10. *Trombicula* (*Eutrombicula*) *yorki* Sambon, 1928.
11. *Trombicula* (*Fonsecia*) *ewingi* Fonseca, 1932.
12. *Trombicula* (*Fonsecia*) *travassosi* Fonseca, 1935.
13. *Hannemania hepatica* Fonseca, 1935.
14. *Hannemania hylodens* (Oudemans, 1910).
15. *Hannemania newsteadi* (Sambon, 1928).
16. *Hannemania stephensi* (Sambon, 1928).
17. *Leuwenhoekia verduni* (Oudemans, 1910).
18. *Schoengastia* (*Trombewingia*) *bakeri*, n. sp.

As already seen, there are no described species of *Trombicula* of the *akamushi* group from this country, a very happy circumstance indeed, taking in account Wharton's hypothesis (8) according to which the carriers of the oriental rickettsiosis caused by *Rickettsia orientalis* belong in every instance, no matter the region where the disease is prevalent, to the small group of some eight species known as the "akamushi" or "tsutsugamushi group". As the survey of the chigger fauna of this country is at its very beginning, it is highly probable that *Trombicula* of other subgenera will be discovered here, as it is the case elsewhere in the Americas. If they will prove to attack human beings or not and if they will prove to belong to the "akamushi group", as it is the case of *Trombicula myotis* Ewing, 1929 of North America, as stated by Wharton (9), is yet to be demonstrated. As a matter of fact, *Eutrombicula alfreddugèsi* is prevalent in the same region where *Rickettsia rickettsi* (identical with *Rickettsia brasiliensis*), the agent of Rocky Mountain Spotted Fever, is endemic and there are no epidemiological or experimental proofs that trombiculid mites can not eventualy act as carriers of this or of some closely related *Rcikettsia,* as do the Ixodids.

This last named species of chigger has an exceedingly wide geographical range and has been recorded as far north as Ontario, Canada, and southwards to Uruguay. In Brazil there are two records under the name *Eutrombicula butantanensis* (Fonseca, 1932), as shown by Jenkins (4): one from man and the other from the snake *Ophis merremii* respectively from S. Paulo and Mato Grosso. A new case of parasitism of man, also from S. Paulo, is now added and illustrated (figs. 8 to 11).

Of the other Brazilian species of chiggers of the subgenus *Eutrombicula, E. batatas* (Lin., 1758) and *E. goeldii* (Oudemans,

Fig. 8 — *Eutrombicula alfreddugèsi,* captured on man
Fig. 9 — *E. alfreddugè i,* nathosoma enlarged

Fig. 10 — *E. alfreddugèsi,* tissue reaction.

1910) were known to attack man, the first one occurring in the State of Amazonas and Pará and the second being recorded only from the State of Pará.

Recently Siqueira Carneiro (2) observed that the fowl chigger, *Apollonia tigipioensis* frequently parasites humans at Limoeiro, State of Pernambuco, Brazil. Chickens and young fowls die frequently when heavily infected, death occurring probably in consequence of secondary bacterial contamination. A case of infection of the Tinamid

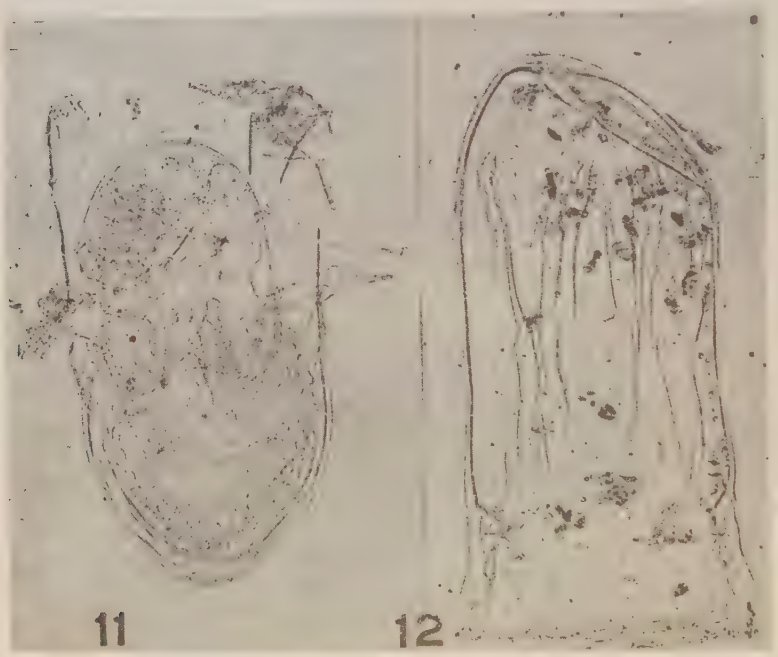

Fig. 11 — Larva of *Apollonia tigipioensis* ant its envolucre. Human case observed by S. Carneiro.

Fig. 12 — Larval envolucre of *A. tigipioensis*. Same material as the precedent figure.

Nothura maculosa cearensis was also observed, this bird being probably the original host. In man nodular lesions of the skin, mostly sepia or sometimes almost black, have ben found on the thorax, neck, axillae and abdomen. The size varies from that of a pinhead to that of an orange seed. A sensation of a firm body is felt by touch. The squeezing of these nodules reveals a whitish body, 1 mm. long by 0,5 mm. wide, containing the larva and its membranous envolucre. Atrophic cicatricial marks remain after healing of the

lesion. Affected people always refer frequent contact with fowls. Endoparasitism of *Trombiculidae* is not a new discovery, but always on batrachians. The following species have been discribed with this habitat: *Endotrombicula penetrans* Ewing, 1931, *Hannemania penetrans* Ewing, 1931. They may even be found in internal organs, as *Hannemania hepatica* Fonseca, 1935, from the liver of the frog *Leptodactylus ocellatus*. The discovery by Siqueira Carneiro that *Apollonia tigiopioensis* Torres et Braga, 1938, the first chigger endoparasitic in birds to be described, can still mantain the same localization on human beings, increases considerably its interest as it establishes a new nosologic condition in the tropics. I have been able to examine Carneiro's material of human origin and I agree with his identification of *Apollonia tigipioensis*. Carneiro's original interpretation of the nature of the involucre as being the stylostoma or histosiphon was recently modified and the name "hyaloteca" is employed to designate this structure. Carneiro believes this capsule to be of chitinous nature and secreted by the parasite after penetration in the host's skin. This membranous structure probably does not represent the reaction of the host tissues to the parasite. It is driven away with the larva and it shows a peculiar opercular apical formation in connexion with the mouth parts (figs. 12 to 13). It seems highly improbable that this shell has a chitinous structure. All the other stages of the life cycle of *Apollonia tigipioensis* remain unknown.

So far as we know, *Apollonia tigipioensis* is restricted to a limited area of northeast Brazil, being only recorded from the State of Pernambuco. It was suggested by the author in a meeting of the Sociedade Brasileira de Entomologia that this Society address to the Agricultural Ministry of Brasil a plead for control measures against the spreading of this mite, a dangerous pest of the fowl industry and at least as annoying to man as *Tunga penetrans*.

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LICE AND THE HISTORY OF SOUTH AMERICAN LAND MAMMALS (1)

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INTRODUCTION

In this paper an attempt is made at establishing the patterns of infestation with lice (Phthiraptera = Mallophaga + Anoplura) of South American land mammals. This is done with the main purpose of obtaining evidence, however circumstancial and indirect, on the history of South American land vertebrates. It is also hoped that studies of this type will furnish elements towards the understanding of the evolution and characteristics of host-parasite relationships, as well as of the evolution of the parasites themselves.

The lice of mammals have been chosen as a subject because the systematics of both hosts and parasites is fairly well known and because mammals are the only South American vertebrates concerning which more or less adequate paleontological evidence is available.

METHODS

All studies of host-relationships based on parasitological evidence rest on the basic assumption of continued specialization of parasite- on host-groups, which is to say, on the parallelism between parasite- and host-systematics.

In view of the fact that secondary disturbances (secondary infestation and extinction) are known to occur in such relationships, it is evident that no phylogenetic or zoogeographical discussions should be based on isolated cases, but rather on patterns of infestation. This self-evident truth has been acknowledged by practically all authors, but not all have applied it consistently in their work.

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In order to obtain the desired patterns we have adopted the following approach (fig. 1):

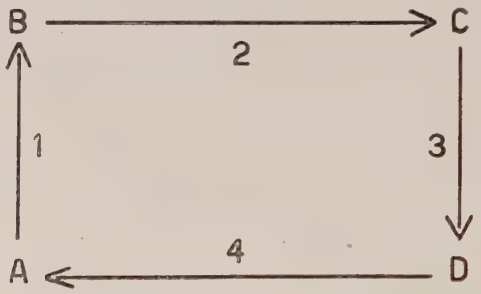

Fig. 1

We start with "A", a natural group of South American land mammals. Such a unit may be anything from a sub-family to a whole order, the choice depending upon the circumstances of each individual case.

Arrow 1 corresponds to the drawing of a list "B" of lice which infest "A".

Arrow 2 corresponds to the evaluation of the relationships of parasites "B" as animals, forgetting for the moment all about their hosts. It is evident that consideration of host-relationships in the evaluation of the affinities of parasites will lead to a circular reasoning, as the conclusion sought would then form a part of the premises; we have not always felt safe in using Webb's otherwise valuable papers for exactly this reason.

The result of the operation indicated by Arrow 2 is a list "C" of the lice which are the closest relatives of "B".

Arrow 3 corresponds to an operation inverse of that indicated by Arrow 1: given the parasites "C", to find out which mammals "D" are infested by them.

Finally, the relationships, systematical and geographical (Arrow 4), between mammals "A" and "D" constitute the answer to our inquiry. The final results may be summarized as follows:

Group "A" of South American mammals is parasitized by lice "B", whose relatives "C", infest mammals "D" which have (or have not) certain relatives in South America and which live in certain regions of the world which stand in a certain relationship to South America.

In the case of some groups of mammals it is important to verify whether the patterns of infestation bear the supposed relationships of the hosts. In such cases the obvious procedure is to

ascertain the relationships between the lice which infest the mammalian groups in question.

The validity of the methods used depends on the validity of the operations indicated by arrows 1, 2 and 3.

Arrows 1 and 3 correspond to operations of listing, and are as reliable as the host-lists used. We are fortunate in having Hopkins' (1949) paper, which includes an enormous amount of critical work and affords a solid foundation to host-association studies.

Arrow 2 indicates a much more delicate operation, that of evaluating parasite relationships without recourse to host systematics. It is well known that the classification of lice is far from being a completely satisfactory one. For the purposes of this paper, however, there is a wealth of available information. We are more concerned with relationships than with taxonomic categories, and the work of Werneck, Ferris and Hopkins has done much towards an understanding of the relationships of species-groups, the raw material of our argument. Furthermore, the work of the above-cited specialists is austerely morphological, avoiding the pitfall of mixing data from morphology and parasitism in the evaluation of relationships.

Even so there are many unsatisfactory areas in lice systematics. For instance, we cannot make much sense out of such groups as *Eulinognathus* and related genera, or even the species of *Pediculus*. These difficult groups have been left aside in our argument, and no conclusions have been based on them. They are, however, a minority, and do not invalidate our premise that the taxonomy of the *Phthiraptera* is sufficiently worked out to permit the drawing of conclusions such as we have attempted.

The main difficulty to be found in this type of investigation is that originating from the incompleteness of the record. Many mammals have not been adequately searched for ectoparasites. This is particularly true of some broad areas of the world, such as the whole Oriental Region, and, curiously enough, North America. We believe this to be the most probable source of modifications of the present status of the problem.

A. SHORT SURVEY OF RECENT SOUTH AMERICAN LAND MAMMALS

Table 1 presents an extract of the classification of Recent South American land mammals, according to Simpson's (1945) system.

The evidence relating to the origin and history of South American mammals has been discussed by Simpson several times; in this paper we shall quote his ideas as they appear in the latest (1950) revision available to us.

TABLE 1

CLASSIFICATION OF SOUTH AMERICAN RECENT LAND MAMMALS

Infra-class Metatheria
- Order Marsupialia
  - Super-family Didelphoidea, Family Didelphidae
  - Super-family Caenolestoidea, Family Caenolestidae

Infra-class Eutheria
- Order Insectivora, Family Soricidae
- Order Primates, Sub-order Anthropoidea, Super-family Ceboidea, Families Cebidae, Callithricidae
- Order Edentata, Sub-order Xenarthra
  - Infra-order Pilosa, Families Myrmecophagidae, Bradypodidae
  - Infra-order Cingulata, Family Dasypodidae
- Order Lagomorpha, Family Leporidae
- Order Rodentia
  - Sub-order Sciuromorpha, Family Sciuridae
  - Sub-order Myomorpha, Family Cricetidae (Sub-family Cricetinae)
  - Sub-order Hystricomorpha, Families Erethizontidae, Caviidae, Hydrochoeridae, Dinomyidae, Dasyproctidae, Chinchillidae, Octodontidae, Capromyidae, Ctenomyidae, Abrocomidae, Echimyidae
- Order Carnivora, Sub-order Fissipedia
  - Super-family Canoidea, Families Canidae, Ursidae, Procyonidae, Mustelidae
  - Super-family Feloidea, Family Felidae
- Order Perissodactyla, Super-family Tapiroidea, Family Tapiridae
- Order Artiodactyla
  - Sub-order Suiformes, Family Tayassuidae
  - Sub-order Tylopoda, Family Camelidae
  - Sub-order Ruminantia, Infra-order Pecora, Super-family Cervoidea, Family Cervidae

Some of the Recent South American mammals can be traced back to Patagonian and Brasilian Early Tertiary beds. Such are the marsupials and the edentates. Simpson believes they are derived from North American ancestors which entered South America in the Late Mesozoic to Late Paleocene, through a land bridge which connected the Americas at the time. These mammals have entirely South American histories during most of the Tertiary, as the isthmic connections were broken during the Paleocene, to be re-established only in Late Pliocene days. Simpson calls these old South American elements "ancient immigrants".

When the land-bridge was re-established, a strong wave of migration came south. The migrant groups comprised mammals

with clear North American Tertiary histories. Their Recent descendants in South America are the insectivores (Soricidae), lagomorphs (Leporidae), sciuromorphs (Sciuridae), myomorphs (Cricetidae), carnivores (Canidae, Ursidae, Mustelidae, Procyonidae, Felidae) and ungulates (Tapiridae, Tayassuidae, Camelidae, Cervidae). These groups are found only in modern South American fossiliferous beds. Some of them have become extinct elsewhere, constituting now characteristic Neotropical elements; some even migrated back to North America. These groups are called by Simpson "late immigrants". There is reason to believe that some of them (Procyonidae) were able to cross the sea barrier before the full re-establishment of the land bridge; this would have been done by "island-hopping".

Two very important groups of South American mammals, the ceboid monkeys and the hystricomorph rodents, are not known from Early Tertiary beds. They are first seen in the Middle Tertiary, already well differentiated and not apparently related to any contemporary northern groups.

It is possible that the monkeys and porcupines were already present in South America by Early Tertiary times, but lived then in regions not represented by known fossiliferous beds. This possibility is enhanced by the fact that they were probably forest-dwellers,

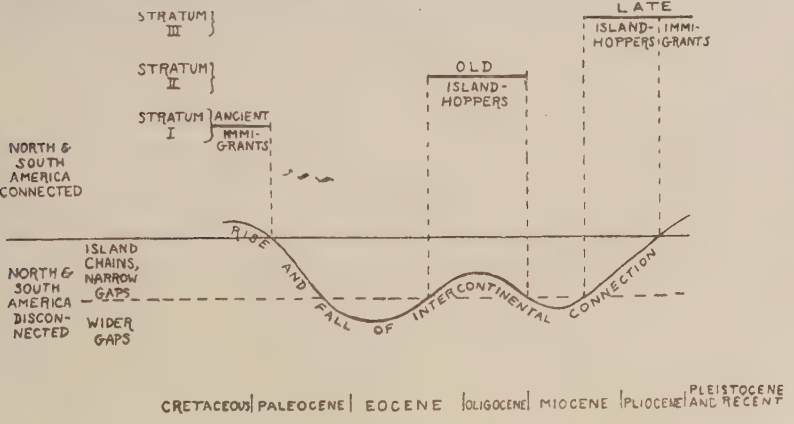

Fig. 2 — A graphic summary of the history of South American land mammals. From Simpson, 1950.

of which no early fossils are known in South America and few elsewhere. Otherwise it may be (as Simpson believes) that they entered South America during the Oligocene, hopping from island to island, as later did the procyonids. For this reason they are called by Simpson "old island-hoppers".

Fig. 2 (from Simpson, 1950) pictures the current ideas on the history of South American mammals.

The relationships of the ceboid monkeys are obscure. They are certainly higher primates but also certainly not closely related to Old World monkeys. Simpson suggests that they originated from generalized prosimians of North American stocks.

The hystricomorphs have supposed relatives in the Old World (the North American porcupines are modern immigrants from the South), especially in Africa. A. Wood (1949) has cast doubt on the naturalness of these relationships, and suggested that the origin of the South American hystricomorphs be sought among North American ischiromyids, a group of fossil rodents.

All in all no positive information is available at present on the origin of these important groups, and all discussions are based on circumstancial evidence.

Before we proceed to discuss the patterns of infestation we shall present some notes, mainly from Cabrera and Yepes' "Mamiferos Sud-Americanos" (1940), on the distribution and ecology of the mammals dealt with in this paper.

1. MARSUPIALS

The South American marsupials belong to two superfamilies, both probably derived from the same Mesozoic didelphoid complex but already well differentiated at the opening of the South American Tertiary.

The didelphids are abundant and well differentiated. As a family they occupy all of South America, some genera reaching Central America and Mexico and one (*Didelphis*, the opossum) extending well into the United States. They occupy a variety of habitats, many species not fearing the proximity of man. As a rule, however, they are forest animals of omnivorous diet, and many genera prefer the vicinity of water.

Two genera of didelphids will be seen to be parasitized by lice: *Marmosa* and *Monodelphis*. Both are widespread genera.

The caenolestids are a relict group: formerly widespread and diversified, they are now restricted to the Andes, from Colombia and Venezuela to Southern Chile. The genus known to be parasitized by lice (*Orolestes*) is restricted to the Andes of Peru.

2. EDENTATES

The South American xenarthrans are said by Simpson to be derived from North American paleanodonts. However, no definite intermediate forms with xenarthran vertebrae are known; all fossil xenarthrans being well differentiated by the time of their Early Tertiary appearance.

The dasypodids (armadillos) are the oldest known xenarthrans. They are semi-fossorial, mostly herbivorous but also scavengers. The family ranges from Patagonia to Central America and the United States (*Dasypus*, recent spread). Although the group is mainly cis-Andean, some forms cross to the Pacific slope. No armadillos, even those forms with more abundant hair, are known to be parasitized by lice.

The bradypodids (tree-sloths) are practically unknown as fossils, but seem to be related to the ground-sloths. They are arboreal animals, extremely slow-moving and indifferent to their surroundings, strict plant-eaters, preferring *Cecropia* (embaúba) leaves. They range over cis-Andean South America to southern Brasil; they also occur in the mountains of Venezuela, Colombia and Ecuador and extend deep into Central America. The two genera of sloths, *Bradypus* and *Choloepus*, are parasitized by lice.

The myrmecophagids (anteaters) are known since the Miocene. There are at present three genera, all of which are primarily ant-eaters. The largest form (*Myrmecophaga*) is a ground-dweller; the smaller ones (*Tamandua* and *Cyclopes*) are arboricolous. The only record of anteater lice (from a *Tamandua* museum skin) is certainly due to contamination.

3. HYSTRICOMORPH RODENTS

The South American hystricomorphs belong to a group of rodents defined by structural modifications of the masticatory muscles and associated skeletal structures. In the same group are traditionally included some families living in the Old World: Hystricidae (Africa and Asia), Thryonomyidae and Petromyidae (Africa) and, by some, Bathyergidae (Africa). Among the South American hystricomorphs we have:

a) ERETHIZONTIDAE (New World porcupines) — The family ranges from Canada to Argentina; one genus (*Erethizon*) strictly North American; one (*Chaetomys*) restricted to Colombia and one (*Echinoprocta*) to eastern Brasil. *Coendou* ranges from Central America to northern Argentina. *Echinoprocta* is the only genus not knwon to be parasitized by lice.

b) CAVIIDAE (cavies) — Small, open-country rodents. In view of their great importance as hosts it is convenient to give more detailed data on the distribution. The striking thing about the geography of the caviids is their absence from the Amazono-Guianan forests; only one form of *Galea* being known from Pará. *Cavia* ranges from southern Brasil and Paraguay to northeastern Argentina; there is also one Andean form. *Galea* is widespread from central and eastern Brasil south; one species reaching the lower Amazonas.

Dolichotis and *Microcavia* are Patagonian. *Kerodon* inhabits eastern and northeastern Brasil. All but *Dolichotis* are known to harbor lice.

c) Hydrochoeridae (capibaras) — Large, river-loving rodents, widely distributed from Panamá to Argentina; not known to be parasitized by lice.

d) Dinomyidae (pacaranas) — Large, paca-like rodents, distributed on the oriental slopes of the Andes and adjacent lowlands from Colombia to Peru and northern Bolivia. Not known to have lice.

e) Dasyproctidae — Medium-sized, forest-dwelling rodents. The agutis (*Dasyprocta*) and pacas (*Cuniculus*) range from northern Argentina to Central America. The cutiaras (*Myoprocta*) range as far north but do not go beyond the Amazonian forest to the south. All genera parasitized.

f) Chinchillidae (chinchillas and vizcachas) — *Lagostomus*, the Patagonian vizcacha, is not known to have lice. *Lagidium*, the Andrean vizcacha, which reaches moderate heights, and *Chinchilla*, a high altitude form, have lice.

g) Octodontidae — Small Andino-Patagonian rat-like rodents. Both genera (*Octodon* and *Octodontomys*) parasitized.

h) Capromyidae — This family comprises two disjunct subfamilies: Capromyinae, the West Indian and Venezuelan hutias, and Myocastorinae, the water-loving coypus, restricted to southern South America. *Capromys* (in Cuba) and *Myocastor* are known to have lice.

i) Ctenomyidae (tuco-tucos) — This family comprises only one genus of small rodents, which ranges from Minas Gerais, Mato Grosso and Bolivia to cis-Andean Patagonia. Known to have lice.

j) Abrocomidae (rat-chinchillas) — Small forms proper to the southern Andes. Also only one genus, which is known to have lice.

k) Echimyidae (spiny rats) — A very widespread and varied group of large rat-like rodents, water-loving, distributed from Central America to southern Brasil east and to Ecuador west of the Andes. Very widely parasitized over the entire range.

4. CEBOID MONKEYS

There are two families of ceboid monkeys: Cebidae and Callithricidae. The latter (marmosets) range from Panamá to southeastern Brasil and are not known to have any lice.

The Cebidae comprise six sub-families:

a) Aotinae — *Aotes* (has lice) ranges from the Amazono-Guianan region to the valley of the Pilcomayo; *Callicebus* (no lice

known) ranges from Colombia and Venezuela to the Chaco Boreal and southern Brasil.

b) Pitheciinae — Amazono-Guianan forms, parasitized.

c) Cebinae (capuchin monkeys) — From Costa Rica and Honduras to northern Argentina east and Ecuador west of the Andes. No lice known.

d) Atelinae — *Ateles* (spider-monkeys) from Mexico to Mato Grosso east and to Ecuador west of the Andes; have lice. *Brachyteles* (also parasitized) is restricted to the Brasilian coastal range from Bahia to São Paulo. *Lagothrix* (no lice known) is widely distributed in northern South America.

e) Alouattinae (howlers) — From Mexico to northern Argentina. Have lice.

5. SORICIDAE

South American shrews are limited to regions near the isthmus (Venezuela to Andes of Ecuador). They belong to a North American genus (*Cryptotis*) of continuous distribution. No lice known.

6. LAGOMORPHS

The South American duplicidentates belong to one single genus (*Sylvilagus*) of the family Leporidae. The genus is widespread both in North and South America. Parasitized.

7. SCIUROMORPHS

South American squirrels are all arboreal; they range over the whole continent to northern Argentina. Most forms belong to the cosmopolitan genus *Sciurus*. Some specialized genera have arisen in the continent. All are heavily parasitized.

8. MYOMORPHS

All South American wild myomorphs belong to the sub-family Cricetinae of the family Cricetidae. They are extremely diversified, wide-ranging and abundant. Many genera are South American endemics. A large proportion are parasitized.

9. CARNIVORES

Five families of carnivores (four of canoids and one of feloids) are known in South America:

a) CANIDAE — South American canids vary from large (*Chrysocyon*) to small. The family occupies the whole continent. The most important genus from our viewpoint is the medium-sized *Dusicyon* (bush-dogs) which ranges from the Guianas to Argentina east and to Peru west of the Andes.

b) Ursidae — Only one bear is known from South America: *Tremarctos,* the spectacled bear of the Andes, which ranges from Venezuela to Bolivia and has lice.

c) Mustelidae — The family is abundant and well-differentiated in South America. The Mustelinae (weasels) range from Yucatan to Patagonia and from the Atlantic to the Pacific. The Lutrinae (otters) have two genera: *Lutra* (cosmopolitan) and *Pteronura* (Brasilian); both having lice. The Mephitinae (skunks) are not represented by North American genera, but *Conepatus* ranges from Magallanes to Texas. Several genera of Mustelinae harbor lice.

d) Procyonidae — Usually medium-sized, omnivorous, forest -and water-loving animals. *Procyon* (raccoons) ranges from Canada to northern Argentina. *Nasua* (coatis) from Arizona to northern Argentina east and to Ecuador west of the Andes. *Potos* (jupará) from Mexico to Rio de Janeiro, from the Atlantic to the Pacific. *Bassaricyon* has barely entered South America. Many procyonids are parasitized.

e) Felidae — There is a large variety of cats in South America, mostly endemic genera or sub-genera; the larger cats, however, the puma and the jaguar, are widespread, ranging into North America. Although several felids have lice, their distribution is not important to our argument.

10. UNGULATES

Under this convenient term are considered the hoofed mammals.

a) Tapiridae (tapirs) — The only genus of South American perissodactyls, formerly widespread but decimated by man, ranges from Central America to northern Argentina. One large widespread form and a smaller one, restricted to the Andes of Bolivia. Neither known to be parasitized.

b) Tayassuidae (peccaries) — Only one genus, with two species, living in bands of a score or more individuals, ranging from the United States and Mexico to Argentina. Known to harbor lice.

c) Camelidae — There are four species of camelids in South America: llama, alpaca, guanaco and vicuña. They are all Andean forms, the guanaco extending into Patagonia. All have lice.

d) Cervidae (deer) — The South American deer are a well-differentiated group, occupying both forest and open country ecotopes, from the Andes to the Amazonian forest. Widely parasitized by lice.

A SHORT SURVEY OF THE LICE WHICH INFEST SOUTH AMERICAN LAND MAMMALS

The major classification of the Phthiraptera here followed is derived from Hopkins' 1949 paper. The detailed classification of the Mallophaga is entirely taken from Hopkins & Clay (1952) and that of the Anoplura from Ferris (1951), unless the contrary is specifically stated. Relationships of genera and species are based on Werneck (1948-1950) and Ferris (1919-1935 and 1951).

The families of interest to us are.

TABLE 2
CLASSIFICATION OF THE PHTHIRAPTERA

Order Phthiraptera

Sub-order Mallophaga (bird and mammal lice)

Infra-order Amblycera, Families Menoponidae (bird), Laemobothriidae (bird), Ricinidae (bird), Boopidae (mammal), Trimenoponidae (mammal), Gyropidae (mammal)

Infra-order Ischnocera, Families Philopteridae (bird), Heptapsogastridae (bird), Trichodectidae (mammal)

Sub-order Anoplura (exclusively mammal lice)

Families Echinophthiridae, Haematopinidae, Hoplopleuridae (Sub-families Hoplopleurinae, Enderleinellinae, Hybophthirinae, Pedicininae, Polyplacinae), Linognathidae, Neolinognathidae, Pediculidae.

MALLOPHAGA

1. TRIMENOPONIDAE

The trimenoponids are an entirely South American family with only 3 genera:

a) *Cummingsia,* 3 species on marsupials.

b) *Trimenopon,* several species on Chinchillidae and one on Caviidae. One species (*T. hispidum*) from *Cavia* has become established on *Sylvilagus,* a lagomorph.

c) *Harrisonia,* 1 species on an echimyid.

The Trimenoponidae are quite closely related to the Boopidae (Hopkins, 1949: 537). Werneck (1948: 5-6) assembles the families Trimenoponidae, Boopidae, Ricinidae and Menoponidae (the latter two of bird lice) under the name Ricinidae. According to him, this inclusive family could be subdivided into three groups: i) trimenoponids; ii) menoponids + boopids; iii) ricinids. These groups are not given formal recognition, but Werneck (loc. cit.) states that they might deserve the rank of subfamilies.

The ricinids and menoponids are parasites of birds, and the affinities of the trimenoponids to bird lice are usually taken as indi-

cative of primitiveness, as the biting lice are supposed to have originated on birds. The boopids are almost peculiar to Australian marsupials, but the genus *Heterodoxus* (5 species) has one single non-marsupiophile species, which lives on domestic dogs and other canids throughout the world.

It would then appear (Hopkins, 1949: 537-538) that the trimenoponids are an old stock, primitively parasitizing marsupials and secondarily hystricomorph rodents, restricted to South America and related to mallophaga of Australian marsupials.

2. GYROPIDAE

The Gyropidae are also entirely South American. Their relationships, on the family level, are not clear. There are 7 genera recognized by Hopkins and Clay:

a) *Gliricola,* many species, parasitizing echimyids, capromyines (3 species in Cuba) and caviids. Similar to what happens with *Trimenopon,* one cavy louse (*Gl. porcelli*) has become established on *Sylvilagus*. The range of *Gliricola* practically coincides with that of their hosts.

b) *Gyropus* is also a large genus, parasitizing caviids, ctenomyids, abrocomids, echimyids and one cricetid rodent, *Scapteromys*. Again one parasite of *Cavia* (*G. ovalis*) has become established on *Sylvilagus*. The range of the genus is also very wide.

c) *Phtheiropoios* is a genus proper to hystricomorph rodents of the Andino-Patagonian region.

d) *Pitrufquenia* (monotypic) is restricted to the coypus (Myocastorinae).

e) *Monothoracius* has two species on caviids and one on agutis (Dasyproctidae).

f) *Aotiellus* (monotypic) parasitizes several forms of the cebid genus *Aotes* (night-monkeys).

g) *Macrogyropus* is found on caviids, dasyproctids, and peccaries (one species peculiar to the genus *Tayassu*).

The Gyropidae seem thus to be an old, vigorous, South American stock, primarily parasitizing hystricomorphs (Hopkins, 1949: 544) but secondarily living on monkeys, cricetids, peccaries and lagomorphs.

3. TRICHODECTIDAE

The trichodectids constitute a large, widespread and rather difficult family.

An important and rather homogeneous group of Trichodectids parasitizes carnivores (Table 3). *Trichodectes*, the central genus, lives on canoids; the ancestral stock seeming to have infested the

very ancestral canoid stock, as there is wide disjunction of the primitive forms of the genus (Werneck, 1948: fig. 239).

Some genera of this group show remarkable host-specificity. *Lutridia,* e.g., occurs only on otters (one South American, one Ethiopian and one Palearctic species). *Stachiella* is restricted to Holarctic and Ethiopian mustelids.

Other genera show geographic limitation. *Neotrichodectes* infests, besides procyonids, only New World mustelids, especially mephitines. *Suricatoecus* (which Werneck considers a valid genus, Hopkins & Clay a possible sub-genus of *Trichodectes* and the unadvised zoogeographer would think a heterogeneous assemblage) parasitizes Viverridae Herpestinae in Africa and canids in the rest of the world. The three species of *Suricatoecus* which live on canids seem to approach the *Trichodectes*-like assemblage, while some of the parasites of viverrids seem to supply transitional forms to the genus *Felicola,* typically feliphile.

TABLE 3

CLASSIFICATION AND DISTRIBUTION OF THE FISSIPED CARNIVORES (SUB-FAMILIES LISTED ONLY WHEN RELEVANT TO THE ARGUMENT)

Orver Carnivora, Sub-order Fissipedia

Super-family Canoidea

Family Canidae, Sub-families Caninae (Eu, As, Af, NA, SA), Simocyoninae (As, Af, SA), Otocyoninae (Af)

Family Ursidae (Eu, As, NA, SA)

Family Procyonidae, Sub-families Procyoninae (NA, SA), Ailurinae (As)

Family Mustelidae, Sub-families Mustelinae (Eu, As, Af, NA, SA), Mellivorinae (Af, As), Melinae (Eu, As, NA), Mephitinae (NA, SA), Lutrinae (Eu, As, Af, NA, SA)

Super-family Feloidea

Families Viverridae (Eu, As, Af, Madagascar), Hyaenidae (As, Af), Felidae (Eu, As, Af, NA, SA).

The genus *Felicola* infests a large number of viverrids (Palearctic, Ethiopian and Oriental) and is also found on a variety of cats, wild and domestic. Only one species, infesting several South American cats and one North American lynx, is known from the Neotropical Region.

Somewhat intermediate between *Felicola* and *Trichodectes* is *Lorisicola* (Werneck, 1950: fig. 1) which parasitizes lorises in the Oriental Region. Rather close to *Lorisicola* is *Cebidicola,* parasite of cebid monkeys. One species of *Cebidicola, C. extrarius,* has been

found on a museum skin of *Tamandua,* but there is almost certainty of contamination (Werneck, 1950: 9).

The very large genus *Damalinia* assembles a variety of parasites of ungulates. The relationships of the forms involved will be discussed in the next chapter.

Somewhat close to *Damalinia* is *Eutrichophilus* (Werneck, 1950: 48), exclusive to New World porcupines (Erethizontidae).

Lymeon, a genus which parasitizes tree-sloths (Ward, 1953), resembles morphologically some parasites of procaviids.

Anoplura

1. haematopinidae

The haematopinids, as defined by Ferris (1951: 81), include only two genera: *Haematopinus* and *Pecaroecus*. The former is widespread on equids, bovids and suids, both domesticated and wild, occurring also on one Indian deer. It has been found on wild animals in the New World. *Pecaroecus,* closely related to *Haematopinus,* occurs on both species of *Tayassu,* the peccaries.

2. hoplopleuridae

This is a vast family, divided by Ferris into 5 sub-families: Enderleinellinae, Hoplopleurinae, Hybophthirinae, Pedicininae, Polyplacinae.

The Enderleinellinae (3 genera) are restricted to sciuromorphs, and are cosmopolitan. The 6 species occurring in South America belong to the large genus *Enderleinellus* (27 species) and do not range south of the Amazon valley, although the hosts reach Argentina.

The Hoplopleurinae are a complex and important group. There are 5 genera, all occuring on rodents. *Hoplopleura* (49 species) is the largest genus, practically cosmopolitan and infesting rodents of all groups. The genus is, however, morphologically very advanced (Webb, 1946: 68 seq.). This apparent contradiction led Webb to call its wide distribution "anomalous". It seems, however, that the key to the extraordinary spread of *Hoplopleura* lies rather on its specializations than on antiquity (as Webb prefers to believe). An advanced genus is in a position to occupy vacant ecological niches or to displace less efficient occupants. The present distribution of the genus (granted the possibility of inter-specific transfer, q.v.i.) does not require any older age than mid-tertiary.

Several (14) species of *Hoplopleura* occur in South America: i) 5 species are restricted to South American cricetids; ii) 4 occur also on more or less closely related hosts in other parts of the world, especially North America; iii) 2 occur on octodontid rodents (hys-

tricomorphs); iv) one on squirrels from Alaska to Bolivia, and v) two on unknown hosts.

One single species of *Hoplopleura* does not infest rodents: *H. ochotonae,* which infests Asiatic species of *Ochotona,* a lagomorph.

Pterophthirus is an endemic South American genus with 4 species: i) *P. alatus,* of *Microcavia,* from Patagonia and northern Ar-

Fig. 3 — Geographical distribution of the genera *Cummingsia* (Mall. Ambl. Trimenoponidae) and *Pterophthirus* (An. Hoplopleuridae). 1 - *Cummingsia maculata;* 2 - *C. intermedia;* 3 - *C. peramydis;* 4, 5 - *Pterophthirus alatus;* 6, 7 - *P. audax;* 8 - *P. imitans;* 9 - *P. wernecki.*

gentina; ii) *P. audax,* of *Proechimys,* from northwestern Ecuador and the lower Amazonas; iii) *P. imitans,* of *Cavia aperea,* only found in Santo Amaro, near the city of São Paulo, Brasil, although carefully looked for by Werneck and Guimarães on many cavies from other localities; iv) *P. wernecki,* of *Proechimys,* from the State of S. Paulo, Brasil.

This very spotty distribution (Fig. 3) and the morphological heterogeneity of the species (Guimarães, 1950:88) indicate a possible polyphylectic origin for the genus, the several forms arising locally from different stocks of *Hoplopleura.* It is not impossible, of course, that they originated from a single, widespread form of *Hoplopleura,* but such a form is not known. It must be noted that, in any case, the two genera are very closely related (Ferris, 1951: 144).

The two remaining genera of Hoplopleurinae, *Ancistroplax* and *Haematopinoides,* are monotypical and parasitize insectivores, respectively in the Oriental and Nearctic Regions.

No Hypophthirinae or Pedicininae occur in South America. The former parasitize rodents (Thryonomyidae and Petromyidae) and the aardvark (*Orycteropus*) in Africa. The latter are strictly Old World monkey parasites.

The Polyplacinae are a large sub-family (16 genera with 70 species) which parasitizes a variety of hosts: i) rodents and lagomorphs over the entire world; ii) insectivores in the Oriental and Palearctic Regions; iii) lower primates in the Oriental and Ethiopian Regions (Madagascar included); iv) Dermoptera in Borneo; v) Equidae (domesticated and wild) in Africa. The following genera occur in South America;

a) *Ctenophthirus,* monotypic, of an echimyid (*Cercomys*), from Paraguay.

b) One species of *Eulinognathus,* on *Ctenomys* (tuco-tucos). Otherwise the genus has a practically unexplainable distribution, infesting African rodents of the families Pedetidae, Bathyergidae and Lophiomyidae and Asiatic rodents of the family Dipodidae.

c) *Galeophthirus* (recently segregated from *Eulinognathus,* on not very sound basis), monotypical, from a caviid from Argentina.

d) *Lagidiophthirus* (see note for *Galeophthirus* above), of a vizcacha in Peru and Bolivia.

e) Two species of the large (25 species) genus *Neohaematopinus*: one on Peruvian abrocomids and one, world-wide on squirrels. The genus is prevalent on squirrels, but other rodents are also parasitized.

Of interest to our argument are also *Haemodipsus,* a genus proper to Holarctic and African hares, of which one species infests both *Lepus* and *Sylvilagus* in North America, and *Proenderleinellus,* a parasite of African thryonomyids.

3. LINOGNATHIDAE

This family has only 4 genera, of which one, *Prolinognathus,* is restricted to hyraxes. The remaining 3 are:

a) *Linognathus,* a large genus (28 species), which infests bovids both domesticated and wild, giraffes and canids, also domesticated and wild, including *Dusicyon,* the Brasilian bushdog. Occurs on almost all continental areas.

b) *Microthoracius,* restricted to camelids in the Old (1 species) and New (3 species) World.

c) *Solenopotes,* which occurs on domesticated bovids and on deer in all continental areas but Africa.

4. PEDICULIDAE

The genus *Pediculus* occurs on man, chimpanzee and ceboid monkeys. The status of the forms is not clear, Ferris (1951) recognizing 4 species: i) *humanus,* which is frequently found on Neotropical monkeys; ii) *pseudohumanus,* typically of ceboid monkeys, but also found on Indians; iii) *schäffi,* of the chimpanzee; iv) *mjöbergi,* of ceboid monkeys. The forms from the monkeys are quite close to *humanus,* and it is not impossible that they originated from it quite recently (on a geological scale). This is the opinion prevalent among specialists (for a good summary see Hopkins, 1949: 447; also Ferris, 1951: 267-280).

PATTERNS OF INFESTATION: DESCRIPTIVE

The principal source of our lists of parasites is Hopkins' (1949) "The host-associations of the Lice of Mammals", supplemented by Werneck's and Ferris' previously cited monographs.

These works have been extremely important not only as lists, but also for the critical evaluation they contain of host-records. Straggling, mislabelling, misidentification, museum contamination and other defects are so frequent in ectoparasitological records that any study such as ours could never be undertaken in the absence of reliable critical work.

In what follows we present the available data on the patterns of infestation of South American land mammals, grouped according to Simpson's criterion into "Ancient immigrants", "Old island-hoppers" and "Late immigrants".

1. ANCIENT IMMIGRANTS

a) Marsupials — South American marsupials are known to be parasitized by only one genus of lice, *Cummingsia* (Mall. Ambl. Trimenoponidae). Three species of *Cummingsia* have been reported: i) *C. maculata,* of *Orolestes incae* (Caenolestidae) from Cedrobamba, Peru; ii) *C. intermedia,* of *Marmosa incana paulensis* (Didelphidae) from Itatiaia, State of Rio de Janeiro, Brasil; iii) *C. peramydis,* of *Monodelphis domestica* from the northeastern regions of Brasil (States of Pará to Bahia).

Orolestes is a caenolestid, *Marmosa* and *Monodelphis* are didelphids; besides this systematic disjunction the distribution of *Cummingsia* is disjunct also geographically (fig. 3). These facts lead to believe that the infestation of South American marsupials by *Cummingsia* is very ancient. It must be remembered also that all trimenoponids are South American, occurring also on rodents and, secondarily, on a lagomorph. The closest relatives of the trimenoponids have already been mentioned as the boopids, of Australian marsupials. Thus the evidence on South American marsupials may be summarized as follows: their parasites are seemingly primary, belonging to a specialized genus of an exclusively South American family; they are related on the family level to parasites of Australian marsupials.

b) Edentates — Armadillos (Dasypodidae) and anteaters (Myrmecophagidae) have been painstakingly searched by Werneck ("apud" Hopkins, 1949: 452) for lice, with negative results, except for the record of *Cebidicola extrarius* from a museum skin, as already discussed. Two parasites of tree-sloths have been described, both belonging to the genus *Lymeon* (Mall. Ischn. Trichodectidae). The genus has no known close relatives, but resembles morphologically some parasites of procaviids.

2. OLD ISLAND-HOPPERS

a) Hystricomorph rodents — A most remarkable group of hosts are the erethizontids (New World porcupines), which are exclusively parasitized by the well-differentiated and diversified genus *Eutrichophilus* (Mall. Ischn. Trichodectidae). This genus is very similar to *Tricholipeurus*, "sensu" Werneck, 1950 (pp. 48, 143), considered by Hopkins & Clay (1952: 355) to be a synonym of *Damalinia,* the species involved being known to infest assorted ungulates in many regions of the world.

Hopkins (1949: 544) considers the presence of trichodectids on porcupines a sign of a former and widespread infestation of rodents with lice of that family. It is probable that the infestation is really an ancient one, but this is no evidence for a widespread infestation of other groups of rodents.

If we exclude the Erethizontidae, the remaining South American hystricomorphs present a very characteristic pattern of infestation. Their characteristic mallophaga are trimenoponids and gyropids (Table 4).

TABLE 4

THE LICE OF SOUTH AMERICAN HYSTRICOMORPH RODENTS

	Caviidae	*Dasyproctidae*	*Chinchillidae*	*Octodontidae*	*Capromyinae*[1]	*Myocastorinae*[1]	*Ctenomyidae*	*Abrocomidae*	*Echimyidae*	*Erethizontidae*
MALLOPHAGA										
TRIMENOPONIDAE										
Trimenopon	+	.	+	.	.	.	.	.	.	.
Harrisonia	.	.	.	.	.	.	.	.	+	.
GYROPIDAE										
Gyropus	+	.	.	.	.	.	+	+	+	.
Gliricola	+	.	.	.	+	.	.	.	+	.
Macrogyropus ...	+	+	.	.	.	.	.	.	.	.
Protogyropus	+	.	.	.	.	.	.	.	.	.
Monothoracius ...	+	+	.	.	.	.	.	.	.	.
Phtheiropoios ...	.	.	+	.	.	.	+	+	.	.
Pitrufquenia	.	.	.	.	.	+	.	.	.	.
TRICHODECTIDAE										
Eutrichophilus ...	.	.	.	.	.	.	.	.	.	+
ANOPLURA										
HOPLOPLEURIDAE										
Hoplopleura	.	.	.	+	.	.	.	.	.	.
Pterophthirus	+	.	.	.	.	.	.	.	+	.
Ctenophthirus ...	.	.	.	.	.	.	.	.	+	.
Neohaematopinus .	.	.	.	.	.	.	.	+[3]	.	.
Eulinognathus ...	.	.	.	.	.	.	+[2]	.	.	.
Lagidiophthirus ..	.	.	+	.	.	.	.	.	.	.
Galeophthirus	+	.	.	.	.	.	.	.	.	.

(1) The two disjunct sub-families of Capromyidae (Capromyinae and Myocastorinae) are treated separately.

(2) Two records, one female each.

(3) One record, one female.

Trimenopon occurs abundantly on caviids and chinchillids and *Harrisonia* on an echimyid. The affinities of the family (primary infestant of marsupials) have already been discussed.

The Gyropidae are also an exclusively South American family, and the hystricomorphs are very probably their primary hosts. The genera *Gyropus* and *Gliricola* are extraordinarily abundant and diversified, infesting many families of rodents over the entire continent. *Gliricola* is the only known parasite of the remarkable Cuban rodent, *Capromys*. The coypus (Capromyidae Myocastorinae) have an exclusive genus, *Pitrufquenia*.

Phtheiropoios is a genus restricted to Andino-Patagonian rodents (Chinchillidae and Ctenomyidae).

In general it may be said that the mallophaga of South American hystricomorphs (Erethizontidae excepted) are a distinctly South American group, with very little host-specialization on the generic level. Their relationships are with mallophaga of South American monkeys and marsupials. The biting lice which infest the porcupines are a seemingly isolated stock of an ancient group, the Trichodectidae.

It should also be mentioned that biting lice which are primarily hystricomorph parasites have become secondarily adapted to late immigrant hosts. Such are the lice known to occur simultaneously on *Sylvilagus* (Leporidae, see below) and *Cavia;* on several hystricomorphs and cricetids (see below), although some of these records have been dismissed as being due to contamination; and the species peculiar to *Scapteromys* (Cricetidae, q.v.) and *Tayassu* (Tayassuidae, q.v.), which belong to hystricomorph-infesting genera.

The pattern of infestation of South American hystricomorphs with Anoplura is exactly opposite (Table 4). All their sucking lice have evident North American relationships. Among the Hoplopleuridae two sub-families are represented:

1) Hoplopleurinae, 6 species: i) 2 species of *Hoplopleura* on octodontids; ii) 4 species of *Pterophthirus* (endemic) on caviids and echimyids. The former genus is prevalent on cricetids, occurring also on squirrels; it is clearly an immigrant. The latter is either a synonym or a late derivative of the former.

2) Polyplacinae, 5 species: i) 1 of *Ctenophthirus* (monotypic) of *Cercomys* (Echimyidae); ii) 1 of *Lagidiophthirus* (monotypic) of *Lagidium* (Chinchillidae); iii) 1 of *Galeophthirus* (monotypic) of *Galea* (Caviidae); iv) 1 of *Neohaematopinus* of *Abrocoma* (Abrocomidae) and v) 1 of *Eulinognathus* of *Ctenomys* (Ctenomyidae). The taxonomy of this sub-family is not satisfactory, as specimens are scarce and good morphological studies have not been done. In any case, the pattern of infestation is clearly that of isolates of widespread groups, and very similar to that of the Hoplopleurinae. We believe both groups to have been introduced in South America at the same (Pliocene) time.

b) CEBOID MONKEYS — The marmosets (Callithricidae) are not known to be parasitized by lice (Hopkins, 1949: 448).

The Cebidae present several interesting cases: i) *Aotiellus* (Mall. Ambl. Gyropidae) parasitizes the night-monkeys (*Aotes*) throughout their range; the affinities of the genus are with *Gyropus*, which has already been discussed; ii) *Cebidicola* (Mall. Ischn. Trichodectidae) infests mokeys of the genera *Alouatta* (howlers, Alouattinae) and *Brachyteles* (Atelinae); the genus is thought (Werneck, 1950: fig. 1) to be close to *Lorisicola*, a parasite of lorises from the Oriental Region. In this manner it is probable that the infestation of cebids with a trichodectid louse is primary and ancient (Hopkins, 1949: 540), the fundamental stock being adapted to primitive primates; iii) 2 species of *Pediculus*, with several proposed subspecies, are known from numerous Neotropical monkeys; at least one record is from a wild host (Hopkins, 1949: 447). As already said, specialists tend to believe they have been acquired from pre-Columbian man (Hopkins, 1949: 542).

3. LATE IMMIGRANTS

a) INSECTIVORA — No parasites are known from South American Soricidae.

b) LAGOMORPHA — The South American "rabbits" are known to be parasitized by three species of Mallophaga: i) *Trimenopon hispidum* (Ambl. Trimenoponidae), ii) *Gyropus ovalis* and iii) *Gliricola porcelli* (the two latter Ambl. Gyropidae). None of these species is peculiar to *Sylvilagus*: they are all cavy parasites. It is remarkable that the only form of *Sylvilagus* ever found infested by biting lice in nature is *S. brasiliensis*, from the States of S. Paulo and Rio de Janeiro, Brasil. One North American *Sylvilagus* is parasitized by a sucking louse of the genus *Haemodipsus*, which is characteristic of hares in North America, Eurasia and Africa; the species in question is also found on *Lepus* in the United States. It seems beyond doubt that the infestation of *Sylvilagus* with Amblycera was acquired in South America.

c) SCIURIDAE — The South American squirrels do not harbor biting lice; three genera of Anoplura are known from them: i) *Enderleinellus* (Hoplopleuridae, Enderleinellinae), ii) *Neohaematopinus* (Polyplacinae) and iii) *Hoplopleura* (Hoplopleurinae).

Enderleinellus (several species present in South America) is cosmopolitan on squirrels. *Hoplopleura* is also present, though not restricted to squirrels in many regions of the world. The only South American form (*H. sciuricola*) ranges from Alaska to Bolivia. *Neohaematopinus* is also typically sciurophile; the species found in South America occurs also on North American and Oriental squirrels.

d) Cricetidae — The South American cricetines are heavily parasitized by Anoplura and rarely by Mallophaga.

No less than fifteen genera or sub-genera of South American cricetines have been found to be parasitized by species of *Hoplopleura,* the only genus occurring in the continent. Whatever the original host-group of *Hoplopleura,* it is certain that it became very well established in North America on (among other hosts) cricetids and sciurids, which brought the lice to South America. Some species of *Hoplopleura* are even common to North and South American rodents of the same or different genera.

There is only one well-proven case of secondary infestation of a cricetid rodent with gyropid lice: that of *Scapteromys gnambiquarae* with a species of *Gyropus* peculiar to the host (Hopkins, 1949: 472). It is not impossible that some of the records written off as contaminations represent actual cases of secondary infestation (Hopkins, 1949: 469, 471, 472, 473).

e) Carnivora — The South American canoids are infested with trichodectid lice of the *Trichodectes* group, whose relationships are with lice of related hosts in other regions of the world. Some clear-cut cases are: i) The otters (Mustelidae Lutrinae): the Brasilian otters are parasitized by one species of *Lutridia,* the two other known species of the genus infesting otters in Europe and Africa. ii) The Procyonidae and Mustelidae Mephitinae, which are parasitized by lice which are characteristic of the respective mammal groups in other continental areas (for further details see the discussion of the Trichodectidae).

The only sucking louse of South American canoids is a species of *Linognathus* (Linognathidae), known from bush-dogs (*Dusicyon*) and very closely related to the *Linognathus* of the Old World canids (domestic dog included).

The only louse found on South American felids is *Felicola felis* (Mall. Ischn. Trichodectidae), known from a variety of southern cats (the largest of which is the puma) and from the North American *Lynx rufus.*

f) Tapiridae — In spite of being well investigated (Hopkins, 1949: 520) the tapirs have not been found to be parasitized by lice.

g) Tayassuidae — One biting and one sucking lice are known from peccaries. The Mallophaga is *Macrogyropus dicotylis* (Ambl. Gyropidae) which belongs to the characteristically South American gyropids. The species is peculiar to peccaries and the genus is also found on agutis (Dasyproctidae) and caviids. Evidently the peccary species was acquired from hystricomorphs.

Pecaroecus javalii (An., Haematopinidae) is the only species of a genus closely related to *Haematopinus* (Webb, 1949: 158); the

latter being a parasite of suids in Africa and Europe, of bovids in Africa and India, and of zebras in Africa, in addition to domestic species.

h) CAMELIDAE — The South American camelids present both biting and sucking lice. Their Mallophaga belong to one species of the genus *Damalinia* (Ischn. Trichodectidae) "sensu" Hopkins & Clay, 1952. Authors of "splitter" tendencies have placed it in a genus of its own, *Lepikentron*. At all events, its closest relatives are lice of sheep, European and North American deer, and reindeer.

Three species of *Microthoracius* (Anoplura, Linognathidae) occur on South American camelids. The fourth species of the genus occurs on African *Camelus dromedarius* (Hopkins, 1949: 552).

i) CERVIDAE — South American deer have lice of the genus *Damalinia* (Mall. Ischn. Trichodectidae) and *Solenopotes* (An. Linognathidae) which are directly related to deer parasites in all regions of the world. The South American form *Solenopotes binipilosus* is also found in North America.

PATTERNS OF INFESTATION: SYNTHETIC

Two major patterns of infestation can be perceived from the evidence at hand:

1. AUTOCHTONOUS

It is not possible to separate "ancient immigrants" from "old island hoppers" on the basis of present knowledge. We shall assemble them under the name "autochtonous elements". Dunn (1931), applying to reptiles the same concepts here discussed for the mammals, called all non-late immigrants "Old Southern" elements. We propose the term "autochtonous" because "Old Southern" is practically untranslatable into languages spoken in South America.

The autochtonous pattern is characterized by the widespread presence of trimenoponids and/or gyropids and by the absence of primary-infesting Anoplura. It would seem also that some trichodectid stocks, *Cebidicola* of monkeys, *Eutrichophilus* of porcupines and *Lymeon* of sloths, are autochtonous elements.

The cases of secondary infestation among autochtonous mammals occur only with Anoplura and are very easily traced.

2. LATE IMMIGRANT

Dunn (1931) has called Late Tertiary immigrants into South America "Old Northern" groups. As this is also a term untranslatable in Portuguese, we prefer Simpson's designation of "late immigrants".

The "late immigrant" pattern of infestation is characterized by the presence of wide-ranging genera of Trichodectidae and Anoplura, especially those which are also present in the Holarctic Region. Pure, uncontaminated, late immigrant patterns are found in South American Sciuridae, Carnivora, Camelidae and Cervidae.

The Cricetidae Cricetinae and the Tayassuidae show superposition of secondary infestations with autochtonous lice. The Leporidae of the genus *Sylvilagus* have acquired typical and unmodified cavy parasites in a restricted region of Brasil, just as they have acquired hare parasites in North America.

THE AFFINITIES OF SOUTH AMERICAN AUTOCHTONOUS MAMMALS

The study of patterns of infestation with lice tends to confirm modern views on the relationships of South American land mammals.

The lice of South American marsupials are related to the lice of the only other Recent marsupials in the world, those of the Australian Region. Whether they were acquired by direct contact or through extinct Holarctic ancestors is, of course, a moot point.

The only workable datum on monkey relationships is the presence of *Cebidicola,* related to *Lorisicola.* This relationship seems to be well grounded on morphological studies, and its implications (closeness of relationship between ceboid monkeys and prosimians) are only natural.

The Old World monkeys (Cercopithecidae) have their own peculiar genus of Anoplura, *Pedicinus* (Hoplopleuridae, Pedicininae). There seems to be no close relationships between these lice and the polyplacine hoplopleurids which parasitize the tupaiid, indrid and lorisid prosimians.

The evidence concerning hystricomorphs is mainly negative. As already seen, the South American families present a rather uniform pattern, characterized by the presence of gyropids and trimenoponids. The only non-South American alleged hystricomorphs which are known to be parasitized are the African Petromyidae, Thryonomyidae and Bathyergidae. The first named are parasitized by Anoplura of the genus *Scipio,* of African relationships. The Thryonomyidae have, besides *Scipio,* Anoplura of the genus *Proenderleinellus,* also typically Ethiopian. Finally, the last named are infested with Anoplura of the genus *Bathyergicola,* of dubious affinities. It seems clear that there is no special relationship between the lice of South American and African hystricomorphs, which would support Wood's thesis of the un-naturalness of the sub-order Hystricomorpha as usually understood.

Finally, in the case of the sloths, nothing can be said but that the infestation with *Lymeon* seems to be primary and ancient.

Except in the case of the hystricomorphs no critical information is provided by the study of the patterns of infestation. Rather to the contrary, current ideas are uniformly supported and no new insight in the problems of origin and relationships of the autochtonous mammals is afforded. On the other hand, this confirmatory evidence is nevertheless valuable, as it increases the confidence in the possibility of inferring relationships from the consideration of patterns of infestation.

SOUTH AMERICA AND THE HISTORY OF THE ANOPLURA

The Anoplura of South American autochtonous mammals seem to be rather recently introduced. Such is clearly the case with the *Pediculus* of monkeys and with the Hoplopleurinae of hystricomorphs. The former is thought to have been acquired from pre-Columbian man, and the latter have clearly been brought south by late immigrant cricetids and sciurids.

The evidence is not so cogent in the case of the Polyplacinae. The taxonomic situation of the group is far from satisfactory, several of the genera being recognized as a matter of expediency. In this manner it is not wise to discuss their relationships. The general pattern of infestation is, however, extremely similar to that of the Hoplopleurinae: a group of Holarctic affinities with disjunct (both from the geographical and host-systematics viewpoints) South American representatives. It is more logical to assume for them a manner of introduction similar to that of the Hoplopleurinae than one of ancient widespread distribution with large-scale extinction.

These facts lead us to believe in the definite possibility of the non-existence of Anoplura as primary parasites of South American autochtonous mammals. This possibility is extremely important. The fact may receive two explanations:

a) Autochtonous Anoplura existed in South America and became extinct.

b) There were no Anoplura in South America at the beginning of the Tertiary.

The first alternative is little probable. Many autochtonous mammals have proved susceptible hosts. It is not likely that this predisposition only appeared in modern times. Otherwise, it is difficult to believe in such a widespread extinction as to efface any signs of a former infestation.

If we acept the premise that no Anoplura existed in South America in the Early Tertiary, two alternative explanations may be proposed:

a) Anoplura existed somewhere but had not been able to reach South America and, by implication, North America.

b) At that time there were no Anoplura at all.

There are no elements in the present argument for choosing between these alternatives. It seems less likely, however, that such a successful group would remain restricted to a limited area on the World Continent (Simpson, 1950) at a time of such extensive mammalian migrations as the Early Tertiary has convincingly been proved to be (Simpson, 1947). If the Anoplura existed as a group by that time, they were certainly a very young one, and the difference between the above alternatives dwindles considerably as far as the age of the group is concerned.

These findings are in complete disagreement with Hopkins' statement (1949: 556-557): "The evidence is all in agrement and makes it very nearly certain that the Anoplura infested the first placental mammals during the middle of the Cretaceous period".

The disagreement between Hopkins' and our ideas stems directly from a matter of method. Hopkins reasons as follows:

a) Anoplura are primary parasites of Perissodactyla, Artiodactyla, Hyracoidea, Pinnipedia, Rodentia, Lagomorpha and Primates.

b) Secondary infestation among these groups is practically impossible, for ecological reasons.

c) It follows that the common ancestor of all these groups must have been parasitized by Anoplura.

The weak link in the reasoning seems to us to be the second. Ecological differences are very great among all these groups of mammals t o d a y. In the Miocene they were much less, and less still in the Early Tertiary (Simpson, 1950: 367), the time of the great mammalian radiation which produced the Recent faunas. The very strong secondary infestation of hystricomorphs with sucking lice acquired from cricetines (much stronger than the movement of gyropids the other way) very clearly shows the possibility of secondary infestation by such an agressive group in face of empty ecological niches. Exchange of lice may occur even between mammals not very similar ecologically, as the acquisition of hystricomorph lice by the peccaries proves.

Jellison (1942: 249), working on North American rodents, came to a similar conclusion, i.e. that the faunal elements of South American origin were parasitized by Mallophaga only, and those of North American origin only by Anoplura.

We do not think the evidence from our study, limited to one faunal region, to be decisive. We only wish to point out a definite possibility; one which might be fruitfully investigated through simi-

lar studies on other areas of the world, especially the Ethiopian and Oriental Regions.

HOST-ASSOCIATIONS

The transmission of lice is direct from host to host, no free-living stages or intermediate hosts being known. Accordingly, any individual mammal may acquire lice from animals of its own species or of other species.

When continued intra-specific transfer prevails, it is to be expected that in time it will become exclusive, as a result of increase in specialization and decrease of outbreeding of the parasites. It is also to be expected that diverging branches of the host-stock will carry with them the ancestral parasites, which will in a measure parallel the diversification of the hosts. An intra-specific lineage of some duration, accompanied by marked specialization, is called a "primary infestation".

The prevalence of this process gives validity to host evolution theories based on parasitological studies. However, is should never be taken for granted, but rather carefully submitted to critical evaluation.

Inter-specific transfer may not be followed by establishment of the parasite on the new host, in which case it is known as "straggling". When inter-specific transfer results in adaptation of the parasite to the new host (secondary infestation), it may lead to a cycle of intra-specific transfer, as described above, with all its consequences.

Continued inter-specific transfer may result in a variety of distributional patterns, according to the circumstances of each case. In extreme cases the parasite infests a variety of hosts over wide areas. More commonly, however, inter-specific transfer is limited by ecological and geographical factors; the resulting pattern is one of widespread genera of lice infesting a variety of hosts of similar ecology in a particular area. Extensive host migrations may broaden the scope of such patterns of infestation beyond the rate of natural spread of the parasites. This is typically the case of the large majority of trichodectid lice allied to *Trichodectes*.

These two major processes (intra- and inter-specific transfer) have been generally acknowledged by authors, but their implications and applications seem not to have received the deserved attention (except by Clay, 1949: 292).

It should never be forgotten that numerous intra-specific lineages (primary infestations) undoubtedly arose from initial inter-specific transfers (secondary infestations). Failure to realize this leads to the assignment of unduly great antiquity and scope to ancestral groups of lice — a type of reasoning only too frequent

in Ectoparasitology. If a parasite infests several groups of hosts and inter-specific transfer is ruled out (including transfer between units of higher level than the species), it follows, by necessity, that

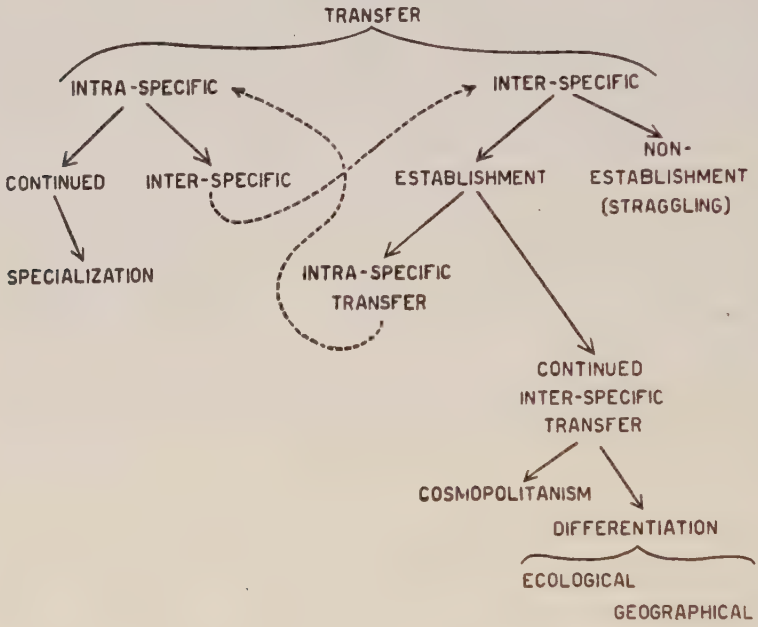

Fig. 4 — A graphic summary of possible courses of host-associations of lice.

the ancestral parasites must have infested the latest common ancestor of the parasitized mammals. In many cases this is obviously absurd. Even in instances where the absurdity is not so evident, alternative explanations should not be discarded "a priori" on the strength of this type of reasoning.

The great barrier to successful inter-specific transfer is certainly ecological. However, the efficiency of such barriers should not be over-stressed. Recent groups of lice are known to have fairly catholic tastes and great range of tolerance, especially some Anoplura and trichodectid Mallophaga. Furthermore, the evaluation of ecological differences should never be based on Recent forms, but on the fossils of pertinent age.The radiation which gave rise to the Recent mammalian faunas happened during the Early Tertiary (Romer, 1945: fig. 257) and many well-defined Recent groups are even younger. Simpson (1950: 367) says: "If we did not know their later history, the early forms would certainly be placed in the same family or even smaller group. For instance, *Protogonodon,* an early

Paleocene form classified as a carnivore, and *Desmatoclaenus,* also early Paleocene, classified as an ungulate, are far more alike than numerous pairs of recent genera referred to one family or subfamily, say *Mustela,* the weasel, and *Gulo,* the wolverine, both commonly placed in the subfamily Mustelinae".

It should also be remembered that processes of intra- and inter-specific transfer are not mutually exclusive, but are in continuous interplay. In all widespread infestations there is always a measure of host-specialization. Such again is the case of the genus *Hoplopleura.*

Processes of inter-specific transfer may lead to results very similar and possibly indistinguishable from those resulting from intra-specific transfer. In this manner a group of lice originating on a restricted mammalian group may spread on the relatives of the original host (inter-specifically), which may lead to sympatry inside a genus. The final pattern should closely resemble that which would obtain had the common ancestor of the several hosts been infested with ancestral lice. We have already stated our belief that this actually happened in the case of *Hoplopleura,* which infests many rodent groups but seems to be an advanced genus. The main groups of rodents show a marked degree of ecological parallelism and geographical contact, which undoubtedly favor inter-group transfer. There is no need of assuming that *Hoplopleura* infested their common ancestors.

Another important factor, which has been remarked upon by Werneck, but never adequately investigated, is the role played by competition among lice on the same host. Records available at present seem to indicate that this factor is important. For instance, the Anoplura of cricetids have been more successful in colonizing hystricomorphs than the latter's Mallophaga in infesting cricetids.

Directly related to this problem is that of empty ecological niches. Mallophaga of hystricomorphs, never very successful in colonizing immigrant rodents, became easily established (3 species) on the lagomorph *Sylvilagus,* otherwise un-parasitized in South America.

Finally, in the interplay between intra- and inter-specific transfer, the matter of actual abundance of parasites should be considered. It is evident that rare species of lice have a smaller chance of intra-specific transfer. Mammals parasitized by such species would then present a high proportion of empty niches available for inter-specific transfer.

GEOGRAPHICAL DIFFERENTIATION

In some groups of parasites (fleas, for instance) there is a strong element of geographical differentiation overlapping and sometimes replacing host-association. In such cases the geographical distribution of the parasite is to a greater or smaller degree independent of that of the host, and there is no great host-specificity. They thus approach the type of distribution characteristic of free-living animals.

It is difficult to assess the importance of such a factor in our material. Ectoparasitologists do not usually keep (or at least publish) records of blank examinations of animals for parasites. It becomes difficult to know whether the lack of records of a certain species for a certain area represents actual absence of the species or just insufficient collecting.

Anyway, in one case it seems that there is a geographical element present in the distribution of South American lice. *Phtheiropoios* (Ambl. Gyropidae) seems to be restricted to the Andino-Patagonian region.

Some other cases deserve attention. Such is that of the several cavy parasites adapted to *Sylvilagus* and so far only found in a restricted region of Brasil (States of São Paulo and Rio de Janeiro). Tapitis from other localities have not been found parasitized. Some species of cavy parasites have only been found in Santo Amaro, State of São Paulo, although the host is widespread and has been searched for lice in many regions.

We wish only to point out the existence of the problem and the need of data for its attack. At present it is not possible to go any further.

EVOLUTIONARY CLOCKS

The fact that secondary infestations can be detected in South America acquires special interest in view of the simple pattern of two major Cenozoic invasions by northern mammals. The evidence indicates that all the exchanges observed occurred in South America, as no autochton parasites are known outside the Neotropical region. This would fix the time of the exchange as that of the Pliocene migration (or late island hopping for special forms). Of course this estimate is only a maximum, as nothing is known of Late Tertiary faunal movements inside South America and, consequently, of the exact moment when contact took place. When more paleontological evidence becomes available, it will be possible to refine our cloks proportionately.

It is not for the present authors to investigate the comparative evolution of mammalian lice with reference to the time element.

It might be pointed out, however, that Anoplura of the *Hoplopleura* group (*Pterophthirus*), seem to have rather faster rates of evolution than the Mallophaga of the family Giropidae.

Another possible method of attacking the problem of evolution than the Mallophaga of the family Gyropidae.
of host and louse differentiation of late immigrant groups. This would depend, of course, on good phylogenetic histories for the Pliocene and Pleistocene, at present not available.

SUMMARY AND CONCLUSIONS

As a result of an attempt to define general patterns of infestation of South American mammals with lice, it is possible to state:

1. Two main patterns can be recognized: a) "autochton", characterized by the presence of gyropids and/or trimenoponids and of certain groups of trichodectids as primary infestants and by the absence of sucking lice also as primary infestants; b) "late immigrant", characterized by the presence of world-wide trichodectids and Anoplura.

2. The autochtonous pattern is characteristic of Simpson's "ancient immigrants" and "old island-hoppers", i.e., of mammals present in South America before the Miocene. The late immigrant pattern is characteristic of Miocene-Pliocene immigrants from North America.

3. Such patterns are sometimes overlapped but never obscured by secondary infestation, which is always easy to detect. Clear-cut cases of secondary infestation are: a) the acquisition by peccaries of hystricomorph mallophaga; b) the acquisition by lagomorphs of caviiphile mallophaga; c) the acquisition by hystricomorphs of immigrant anoplura.

4. Circumstancial evidence from the study of patterns of infestation tends to be in favor of Wood's hypothesis of non-relationship between South American and Old World hystricomorphs. The data on relationships of the ceboid monkeys and of the marsupials are in accordance with what is known of their relationships. The evidence on edentate relationships in inconclusive.

5. The probable absence of primary-infesting Anoplura on autochtonous mammals points to the possibility of a much more modern origin for the sucking lice as a group than formerly believed. Instead of Mid Cretaceous they might be considered an Early Tertiary group.

6. The possibility of identifying secondary infestation in South American provides "evolutionary clocks" for the evolution of lice, as it is possible to assign a maximum length of time (since the late

immigration) for the duration of parasitism on the secondary hosts.

7. Some problems of method are discussed, especially concerning the drawing of the patterns of infestation and the evaluation of host-parasite historic relationships.

8. Some cases of possible geographical differentiation of lice independent of host distribution are pointed out, but no discussion is attempted.

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NEW NORTH AMERICAN TABANIDAE. IX. NOTES ON AND KEYS TO THE GENUS *CHRYSOPS* MEIGEN (1)

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Part VIII of this series in the immediately preceding number of this Journal (Vol. 2: 13-60) provided notes on and keys to all North American species and genera of Pangoniinae exclusive of the genus *Chrysops* Meigen. The present paper completes the review of this subfamily of North American tabanid flies, and was finally separated from Part VIII because of publication requirements; Acknowledgments and an inclusive Abstract for Part IX will be found in the introduction to Part VIII. The Bibliography concluding the present part applies to both.

The inclusion of Mexican, Central American, and Caribbean species of *Chrysops* in this treatise has complicated dichotomous analysis of the North American fauna due in part to intermingling of Neotropical and Nearctic elements. The occurrence of atypical specimens and of several variable species often with characters that are intermediate between major sections in this diverse fauna has made it necessary to provide cumbersome groups of characters in some couplets for guidance. This has also prevented desirable adaptation of Kröber's major groups of Neotropical and Palaearctic *Chrysops* for expeditious reference of North American species, though one familiar with the fauna would know the groups to which he refers.

It does appear possible, however, to assist more rapid though tentative sorting by providing a condensed key to major divisions with the admonition that this will only simplify bulk reference of typical material, but as a few species have been keyed between sections, it cannot be relied upon for critical analysis. Examples of some standard terminology have been figured for certain species

(1) From the U. S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, National Microbiological Institute. Received for publication January 8, 1954.

(head, fig. 1 and wing, fig. 5a). As usual the sexes have had to be keyd separately, many species being sexually dichromatic, and the holoptic males often with more extensive infuscation of the wings than in the dichoptic females.

OPTIONAL CONDENSED KEY TO MAJOR DIVISIONS

(fig. 6a)

A.	Apex of wing hyaline beyond crossband	♀ couplet 5, ♀ couplet 4
B.	Midfacial pollinosity present (fig. 1)	♀ 6, ♂ 5
BB.	Midface mostly bare	♀ 13, ♂ 11
AA.	"Apical spot" present (fig. 5a)	♀ 18, ♂ 13
C.	Midfacial pollinosity present	♀ 19, ♂ 15
D.	Antennae and facial calli inflated, front wide (fig. 2)	♀ 22, ♂ 28
DD.	Antennae and facial calli not unusually swollen, front between antennae and vertex taller than basal width (fig. 4)	♀ 40, ♂ 18
CC.	Midface mostly bare except occasionally just below antennae	♀ 55, ♂ 43
E.	Females	
F.	First basal cell with infuscation to apex	(couplet) 61
G.	Apex of "hyaline triangle" not reaching cell R_1	66
GG.	Hyaline triangle crossing into cell R_1 (fig. 5a, b)	74
FF.	First basal cell (fig. 5a) hyaline across at least apex or more	85
H.	Apex of hyaline triangle reaching or crossing into cell R_1	88
I.	Apical spot narrow and barely crossing into cell R_3 at apex of wing	95
II.	Apical spot "drop-shaped" distinctly widened beyond juncture with crossband (fig. 5c) ..	107
HH.	Hyaline triangle not reaching cell R_1	116
EE.	Males	
J.	Apical spot moderate, not filling more than half of cell R_4	46
K.	Apical spot narrow along costa to apex of wing	47
KK.	Apical spot widened to fill about half of cell R_4 (fig. 6c)	55
JJ.	Apical spot filling cell R_4 (except sometimes immediately around "fork") or even extending beyond (fig. 6b)	72

LL. Body predominantly blackish, sometimes abdomen with obscure reddish lines 74

LL. Abdomen and usually thorax with a bright yellow and black pattern 60

M. Apex of hyaline triangle nearly or quite crossing cell R_3 (fig. 6c) 62

MM. Hyaline triangle enveloping little more than the "fork" in cell R_3 63

KEY TO FEMALES OF NORTH AMERICAN *CHRYSOPS*

1 - Wings entirely hyaline (a small blackish species with entirely bare black face and cheeks) [subgenus *Leochrysops* nov.] ..... *hyalina* Shannon

Wings pictured (infrequently faint, and then with the face at least yellow in the middle and/or with lateral pollinosity) 2

2 - Central American species with the wing picture fenestrate and much fragmented, the two basal cells predominantly hyaline, and the antennae slender 3

Not such species though the discal cell may be fenestrate (Nearctic species with suggestions of broken crossbands have either swollen scapes, or at least the first basal cell predominantly infuscated) 4

3 - Thorax and abdomen dark brown with small flat yellow triangles on the incisures; callosity yellow; a prominent spot in the discal cell, and at the fork; antennae subequal to notum in length ..... *caloptera* Hine

Body prominently gray striped and banded; callosity blackish; no isolated spot in the discal cell, that at the fork faint; antennae much shorter than notum ..... *elleni* Fairchild

4 - Peculiar greenish-gray central California species with very reduced eye pattern in life; face and front unsually hairy including sides of late-

rally attenuated frontal callosity; wing pattern unusual with strong halo along outer margin of abbreviated crossband and the apex beyond tinted though no definite apical spot is evident ..... *hirsuticalla* Philip

Not with this combination of characteres 5

5 - Apex of wing beyond crossband hyaline, at most an occasional, indefinite trace of infuscation along costa 6

Apex of wing beyond crossband definitely infuscated to varying extents, i.e., "apical spot" present . 18

6 - A midfacial gray, yellow, or orange pollinose stripe beneath antennae one-half to three-fourths the distance to the oral margin 7

No midfacial pollinose spur or stripe 13

7 - Sides of at least the first two abdominal segments with yellow to reddish areas 8

Abdomen entirely blackish or with an indefinite pattern due to grayish vestiture 10

8 - Hind margins of tergites gray; inverted black "V" on tergite 2 flat with lateral extensions restricting red to anterior corners; infuscation of second basal cell much less than first (apical costal margin often with as indefinite smoky tinge) ... *sordida* Osten Sacken

Hind margins of tergites not pale though there may be median triangles, or inward expansions of the red or yellow sides across the incisures in occasional specimens; infuscation in two basal cells subequal . 9

9 - Wing picture rather dilute; anterolateral areas of abdomen dull gray-yellow not reaching beyond tergite 2; pleural pile pallid ..... *cuclux* Whitney

	Wing picture saturate; abdomen laterally deep yellow to reddish often extensive; pleural pile yellow	*excitans* Walker
10 -	Cell Cu_1 with basal, hyaline lunule	*carbonaria* Walker
	Cell Cu_1 entirely infuscated basally	11
11 -	Crossband not usually reaching hind margin in cell M_3; pleural pile gray	*mitis* Osten Sacken
	Crossband complete to hind margin; pleural pile orange	12
12 -	Anal area hyaline	*celeris* Osten Sacken
	Anal area smoky, leaving only two reduced hyaline spots distally in the basal cells	*celeris nigroptera* Fairchild
13 -	(6) Entire wing in basal two thirds infuscated	*divisa* Walker
	Wing with definite hyaline areas in the basal and anal cells	14
14 -	Wing picture dilute, crossband fading well before hind margin	15
	Wing picture with crossband saturate and complete to hind margin ..	17
15 -	Both basal cells entirely hyaline, abdomen with yellow pattern basally	16
	First basal cell dilutely infuscated, abdomen entirely dark	*nigribimbo* Whitney
16 -	Median dark figure on tergite 2 paired and not reaching anterior margin	*fulvistigma* Hine
	This figure a solid triangle crossing the tergite	*fulvistigma dorsopuncta* Fairchild
17 -	Crossband usually brown, terminating abruptly in cell M_3; face broadly yellow to oral margin between the sutures	*nigra* Macquart
	Crossband blackish, invading cell Cu_1 (fig. 6a) midfacial yellow reduced and not reaching oral margin (fig. 4)	*nigra taylori,* subsp. nov.
18 -	(5) Face with at least a distinct median pollinose stripe (fig. 1) (least in *clavicornis*)	19
	Face bare in the middle of at least the lower two thirds (fig. 4) (so-	

metimes a short transverse pollinose spur below each antenna and exceptionally an attenuated, adventitious median one)	55
19 - The midfacial pollinosity complete to the oral margin	[illegible]
Midfacial pollinose spur incomplete but extending downward at least to [illegible]	[illegible]
20 - Discal cell fenestrate; facial pollinosity extensive, the denuded sublateral facial areas reduced by expansion of stripes below (Fig. 3) apical spot joined to crossband [illegible]	*discalis* Williston
[illegible] narrow and widely separated from the lateral stripes (1); hyaline triangle produced to costal margin separating the broad apical spot from crossband (southeastern species)	*abata* Philip
21 - A large, unusually hairy, Neotropical species with robust but not swollen antennae, two large, dark, transverse calli on the front and vertex, facial calli variegated black and pale brown, apical spot not wider distally than cell R_1 but widely separated from crossband, and abdomen with quadrivittate, bigeminate pattern	*chiriquensis* Fairchild
Not with this combination of cha- [illegible]	22
22 - Antennae with scape and often pedicel, also usually facial calli, distinctly inflated; front wide, callosity usually protuberant, narrow and attenuated laterally	23
Antennae and facial calli not abnormally swollen; front taller than wide, the callosity usually rather broadly ovoid	40

(1) Adventitiously, the holotype of the northern *C. frigida xanthas* Philip also shows this character.

23 - Apical spot narrow barely entering cell R_4 at apex of wing 24

Apical spot widened to cross at least half of vein R_4 into cell R_4 25

24 - Abdomen bivittate, broadly yellow on the sides; cells Cu_1 and second basal hyaline (southwestern U. S.) *dissimilis* Brennan

Abdomen quadrivittate with double geminate spots on the tergites; both above cells with basal infuscation (Mexico and Central America) .. *affinis* Bellardi

25 - Apical spot produced beyond vein R_5 at least as a spur in cell R_5 ... 26

Apical spot abruptly terminating in cell R_5 28

26 - Discal cell fenestrate; scape of antenna evenly swollen (barrel-shaped) ..... *fulvaster* Osten Sacken

Discal cell uniformly infuscated with rest of crossband; scape bottle-shaped (midfacial pollinose spur narrow or even broken) 27

27 - Abdomen quadrivittate from tergite 3; second basal cell infuscated in the basal fourth diagonally to half that in the first ..... *clavicornis* Brennan

Abdomen with only two distinct rows of submedian spots, and with at most shadows of sublateral spots on tergites 4 or 5; second basal cell infuscated only in the extreme base *clavicornis brennani*, subsp. nov.

28 - Discal cell prominently fenestrate ..

Discal cell saturate, or with at most a reduced streak but little lighter than the rest of the crossband .....

29 - Crossband typically with a toothlike projection along vein R_{4+5} to fork; apical spot suddenly widened in cell R_3 to make adjacent margin of hyaline triangle markedly sinuous; hyaline spot in cell Cu_1 crossing prominently into cell M_3 ..... *latifrons* Brennan

Crossband sometimes sinuous outwardly but no projection to fork; apical spot not suddenly widened in cell R_3; hyaline spot in Cu_1 indistinctly or not at all crossing vein Cu_1 ..... *pachycera dilata* Rowe and Knowlton

30 - Midfacial pollinose stripe flanked by black and yellow integumental spots; cheeks black (fig. 1) 31

Face and cheeks predominantly or entirely yellow, the facial pits sometimes black 34

31 - Fore coxae and femora predominantly yellow; infuscation in second basal cell truncated and about half the length of that in the first basal cell; apex of hyaline triangle in cell R_1 triangular, widening behind into cell R_3 [southwestern U. S.] ..... *facialis* Townsend

Fore legs, including coxae, predominantly black or brown; infuscation in basal cells otherwise; hyaline triangle produced bluntly into cell R_1, little or not at all wider in the upper half of cell R_3 [Mexico] ... 32

32 - First basal cell almost entirely infuscated; all legs blackish; abdomen predominantly blackish, the yellow reduced anterolaterally and on incisures ..... *mutata* Pechuman

First basal cell hyaline in the distal fourth or more; mid and hind legs and abdomen extensively yellowish to gray 33

33 - Cell Cu_1 with a pale area; mid and hind femora predominantly yellow . *balzaphire*, n. sp.

Cell Cu_1 infuscated; femora all dark *altivaga* Osten Sacken

34 - Flagellum of antenna very short, the terminal annuli chunky, but little constricted and together shorter than the basal annulus, and the whole shorter than the scape; outer margin of crossband sinuous with a

hyaline notch in cell R_5; abdomen with four rows of dark spots, usually from tergite 2 on ..... *virgulata* Bellardi

Not with this combination of characters; if the flagellum appears shorter than the scape, the basal annulus is much thicker than the slenderized terminal annuli 35

35 - Apical spot markedly irregular due to extension of a tooth inwardly along vein R_4 to almost enclose the widened apex of the hyaline triangle in cell R_3; outer margin of crossband with step-like expansion to fork; abdomen quadrivittate ... *subcaecutiens* Bellardi

Not with this combination of characters 36

36 - (2) Crossband with an outer bulge toward the fork (fig. 5b) making the apex of the hyaline triangle a compressed diagonal streak in cell R_3 with subparallel sides which terminates bluntly in the middle of cell R_1 across vein R_{2+3}, the inner margin of the apical spot thus crossing vein R_4 just beyond the knee (unusually hairy, dull colored species, the midventral black band diffuse and not sharply contrasting) 37

Outer margin of crossband fairly straight, the apex of the hyaline triangle resting on or only occasionally crossing vein R_{2+3}, the sides widely divergent so that the apical spot crosses vein R_4 at about the middle or beyond (fig. 5c) 38

37 - Tergite 2 with two inverted, triangular spots either separated or feebly joined near and sloping away from the anterior margin; tergites 3 and 4 usually quadrivittate, occasionally with only paired submedian spots; face entirely yellow ..... *coquilletti* Hine

(2) Material of much of this southwestern *pachycera* group is still too meager for adequate evaluation of limits of specific or subspecific variation.

Tergites 2 to 4 or 5 with double geminate black spots resting on the anterior margins; midfacial pollinose stripe sometimes margined with black ..... *coquilletti robusta* Brennan

38 - Infuscation in second basal cell about half that in first and sharply diagonal or semitruncated; median figure on tergite 2 usually divided mesally, separated from the anterior margin and sloping outwardly to the lateral angles; size 6.5 - 8 mm. 39

Infuscation in second basal cell gradually sloping diagonally from base to anterior half, almost as far as that in the first; geminate, or occasionally divided, figure on tergite 2 usually resting, broadly on the anterior margin, the sides subparallel (fig. 7c); size more robust, 7.5 - 9 mm. ..... *wilcoxi*, n. sp.

39 - Abdominal pattern in the main bivittate, the sides broadly yellow ... *pachycera* Williston

Abdominal pattern at least from tergite 3 on, with four rows of spots which may or may not be geminate in various combinations ..... *pachycera hungerfordi* Brennan

40 - (22) Abdomen yellow, quadristriate above and tristriate below; sides of thorax with contrasting yellow stripes; fore legs including coxae predominantly yellow; first basal cell completely infuscated, the second hyaline, the apical spot drop-shaped ..... *sequax tau*, subsp. nov.

Not with this combination of characters 41

41 - Both basal cells completely hyaline (or the first faintly tinted basally), apical spot extensive, practically filling cell R_4, and usually with a spur in R_5; midfacial pollinosity in form of a Greek upsilon with an arm or spur under each antennae

	and the stem acuminate below, face yellow in the middle	*upsilon* Philip
	Not with this combination of characters; facial integument entirely black (except in variants of *frigida*)	42
42 -	Apical spot a very narrow shadow along costal margin; abdomen black with reduced red spots on the sides of tergites 1 and 2, and narrow tergal incisures expanding into a median row of flat or low gray triangles	[some *sordida* Osten Sacken, see 8 above]
	Not with this combination of characters	43
43 -	First basal cell completely infuscated, second entirely hyaline (apical spot separated from crossband) ...	44
	Both basal cells partially infuscated	45
44 -	Abdomen yellow with a uniform, longitudinal, blackish, middorsal band	*dorsovittata* Hine
	Abdominal integument entirely black	*separata* Hine
45 -	Hyaline triangle crosses vein R_{2+3} usually separating apical spot from crossband	46
	Hyaline triangle seldom reaches R_{2+3} (i.e., apical spot at its juncture with crossband usually wider than cell R_1)	50
46 -	Upper pleural pile bright orange or reddish [eastern U. S.]	47
	Thoracic pile grayish-yellow and black [western U. S.]	48
47 -	Anal area of wing hyaline; two hind pairs of femora with pale hairs ..	*amazon* Daecke
	Anal area infuscated; all femora dark haired	*amazon hubbelli*, subsp. nov.
48 -	Tergites 1 an 2 laterally reddish ..	*noctifera* Osten Sacken
	Abdomen entirely black (adventitiously, tergite 2 may have an indefinite red shadow laterally)	49

49 - Apical spot moderately broad crossing vein R_4 at the outer half or less of its length; crossband abbreviated — *noctifera pertinax* Williston

Apical spot broader and more definitely outlined, crossing vein R_4 at the "knee"; crossband practically filling cell M_3 to the margin (early spring species in northern California) ..... — *pechumani* Philip

50 - Abdomen predominantly blackish, reduced lateral red spots on tergites 1 and 2, incisures narrowly gray expanding into flat gray triangles in the middle; apical spot half or less the width of cell R_3 at its juncture with crossband; second basal cell infuscated about half that of first . — 51

Abdomen otherwise, sometimes with bright yellow incisures or if occassionally predominantly blackish, apical spot at its juncture with crossband almost filling cell R_3; infuscation of both basal cells often subequal ..... — 52

51 - Outer margin of crossband with tooth-like extension along vein R_{4+5} to the fork; apical spot with little or no mesal expansion, and crossing vein R_4 diagonally ..... — *nigripes* Zetterstedt

Crossband sinuate outwardly but without tooth at fork; apical spot suddenly expanded in cell R_2 by crossing and paralleling vein R_4 on its distal three fourths ..... — *zinzala* Philip

52 - Face, legs, and usually abdomen predominantly yellow ..... — *frigida xanthas* Philip

Facial integument and at least fore legs including coxae, black ..... — 53

53 - Abdominal incisures 3 to 6 with sharply contrasting, yellow integument giving the abdomen a banded appearance, the wide black basal bands almost never completely divided in the middle ..... — 54

Abdomen not with a yellow and black banded appearance, or when incisures are yellow, the black is reduced to median geminate or divided maculations well separated from the lateral margins ..... *frigida* Osten Sacken

54 - Apical spot barely wider than cell R_1 at its juncture with crossband; the latter serrated and terminating well before the hind margin; first two sternites with median black spots; hind tibiae reddish-brown .. *asbestos* Philip

Apical spot broader, filling cell R_3 except immediately around the fork (as in *frigida*); venter predominantly yellow to sternite 5; hind tibiae black ..... *venus* Philip

55 - (18) Base of vein R_4 (the fork) with a prominent, isolated cloud or this may be an extension from the crossband (occasionally faint in dusky *brimleyi*) 56

The fork with no prominent cloud though the area may be included in apical tinting of the wings or in occasional specimens with bicolored bodies there may be an indefinite shadow (as in Neotropical *aurogut-tata,* see 104 below) 60

56 - Abdomen blackish, sometimes with suggestions of a grayish pattern .. 57

Abdomen with a contrasting yellow pattern at least on sides of tergite 2 [Neotropical] 59

57 - Callosity yellowish; entirely blackish-bodied Central American species with over half of each basal cell hyaline; hyaline triangle somewhat sickle-shaped, enclosed by the dilute apical spot ..... *soror* Kröber

Callosity black; dull grayish-black eastern U. S. species with first basal cell three-fourths to completely infuscated; the hyaline triangle widely open behind 58

58 - Apical spot narrow just reaching into the outer corner of cell R_4; outer margin of crossband nearly straight or gently bowed ..... *brimleyi* Hine

Apical spot broad and drop-shaped; outer margin of crossband strongly bowed ..... *fuliginosa* Wiedemann

59 - Callosity and pleura entirely black; face and cheeks black, narrowly yellow in the middle ..... *fairchildi,* n. sp.

Callosity, face and cheeks yellow, the first with a brown upper margin; a grayish or yellow, conspicuous, pollinose spot on each side beneath the base of the wing 59a

59a - Tergites caudad of 2 with yellow incisures; cloud on fork always an extension of crossband [Panama] . *calogaster* Schiner

Tergites caudad of 2 entirely black; cloud on fork may or may not connect with crossband [Mexico] .... *mexicana* Kröber

60 - (55) A rather variable, robust, predominantly yellowish, Pacific Coast species with black callosity and facial pits, usually bigeminate abdominal pattern, often dilute wing picture, crossband strongly bowed outwardly and seldom reaching hind margin, narrow apical spot, and variably-infuscated, first basal cell (occasionally completely so) ..... *bishoppi* Brennan

Not with this combination of characters 61

61 - First basal cell completely infuscated, if there is a hyaline spot in the apex, it does not plainly cross the cell; crossband always reaching hind margin 62

First basal cell with at least a subapical hyaline spot crossing the cell, sometimes almost entirely hyaline (in *C. montana* a spur occasionally reaches the apex); crossband not always reaching hind margin (ex-

cept *shermani* with fragmented wing pattern) 85

62 - Crossband and apical spot fragmented by diluted vein margins; abdomen striate ..... *shermani* Hine

Vein margins in crossband and in apical spot not unevenly diluted; abdomen variable 63

63 - Wing pattern dilute luteofuscous and with the usual hyaline areas luteous or tinted 64

Wing pattern in sharper contrast with definite hyaline areas 65

64 - Abdominal pattern indefinite; scapes swollen; apical spot wide, extending around hind border of wing [some *brunnea* Hine, see 116]

Abdominal pattern contrasting, quadristriate lateral lines starting from middle of tergite 2; antennae normal; apical spot rather narrow to apex of wing, (a short midfacial pollinose spur under the antennae) . *luteopennis* Philip

65 - Apex of hyaline triangle nearly reaching or even crossing vein R_{2+3} and often crescentic above (in occasional *parvula* and *dacne* with entirely dark abdomens, its projection above the fork in cell R_3 is only vaguely indicated by a reduced sub-hyaline crescentic margin along the crossband) 74

Hyaline triangle otherwise; if open to the margin behind, apex not usually produced beyond a point just enveloping the fork and never crescentic above; abdomen always prominently bicolored 66

66 - Entire apex of wing infuscated except for an isolated fenestrate spot in cell R_3 above the fork ..... *bistellata* Hine

Apical wing pattern otherwise 67

67 - Crossband continuing across at least the base of cell Cu_1 68

Crossband terminating abruptly in cell M_3 though vein behind cell Cu_1 may be more faintly margined ... 71

68 - Frontal callosity and scutellum entirel yellow 69

Frontal callosity and scutellum predominantly dark 70

69 - Abdominal stripes conspicuous, black; apical spot with at most a spur in R_5 ..... *vittata* Wiedemann

Abdominal and thoracic pattern indistinct; brownish apical spot continuous into cell R_5 ..... *vittata floridana* Johnson

70 - Abdomen with two rows of spots, those on tergites 2 and 3 completely divided; apex of hyaline triangle just enveloping fork ..... *inda* Osten Sacken

Abdomen quadrivittate, the median spots on tergites 2 and 3 geminate; hyaline triangle crosses half or more of cell R_3 ..... [occasional *montana* Osten Sacken, see 86]

71 - (67), Hyaline triangle sharply limited to the apices of cells M_1 and M_2, cell R_5 usually completely infuscated (midventral black band usually reaches forward only to sternite 3) *moecha* Osten Sacken

Hyaline triangle at least invading cell R_5 inwardly 72

72 - Abdomen with two submedian dark lines usually expanded caudad (rarely obsolescent), the sides yellow at least anteriorly; apical spot crossing apex of cell R_5 (a complete, broad median, ventral black band) . *univittata* Macquart

Abdomen quadristriate; at most a disconnected spur of the apical spot in cell R_5 (if rarely cell R_5 is predominantly infuscated, sternite 2 is mainly yellow) 73

73 - Frontal callosity yellow (rarely black); apical spot with spur in cell R_5 leaving only a small halo about

the fork; submedian lines seldom geminate on abdomen and the four lines typicallly subequal ..... *aberrans* Philip

Frontal callosity black, occasionally brown; apical spot less extensive leaving a larger halo at fork; submedian lines often geminate on one or more tergites and the lateral ones usually less distinct on each tergite posteriorly ..... *striata* Osten Sacken

74 - (65) Apical spot broad, filling at least half of cell R_4 or usually more and leaving the apex of the hyaline triangle customarily acuminate and crescentic 75

Apical spot moderately to not at all widened along the costal border and entering cell R_4 only in the apical corner 82

75 - Frontal callosity yellow often with brown upper margin 76

Frontal callosity black or occasionally with brown shades 77

76 - Hyaline triangle with wide base on hind margin behind cell R_4, crossband never invading cell Cu_1; abdomen usually quadristriate ..... *beameri* Brennan

Hyaline triangle very narrow, more crescentic, apical spot usually invading cell M_1, crossband often crossing cell Cu_1 as a lighter shadow; abdomen usually with two accentuated submedian stripes ..... *hinei* Dæcke

77 - Abdomen nearly its full length bright yellow and black striate 78

Abdomen dusky, sometimes with one or three abbreviated suggestions of rather obscure reddish lines 79

78 - Abdomen with two submedian black stripes; apex of hyaline triangle a blunt spot above the fork ..... *pikei* Whitney

Abdomen with four contrasting black stripes; apex of hyaline trian-

	gle crescentic (crossband may be extended across cell Cu_1 as a paler shadow)	*sequax* Williston
79 -	Thorax with a conspicuous yellow stripe on each side above the wing base	80
	Thoracic yellow bands confined to the pleura	81
80 -	Abdominal pattern usually consisting of three dirty, yellowish stripes, sometimes obsolescent laterally	*obsoleta* Wiedemann
	Abdomen dark, without pattern or only trace of a median yellow stripe	*obsoleta lugens* Wiedemann (syn. *ultima* Whitney)
81 -	Hind legs predominantly yellowish to brown; abdomen usually with at least suggestions of one or three gray or yellow stripes; apical spot crossing into cell R_5 at least as a shadow	*dacne*, n. sp. (*lugens* of authors)
	Hind legs predominantly fuscous; abdomen dark, seldom with obscure pattern on tergite 2; apical spot usually fading in cell R_4	*parvula* Daecke
82 -	(74) Face typically yellow between sutures (sometimes narrower); apical spot often broadened with indefinite hind margin; tergites 1 and 2 usually with a straight-sided figure and 3 with an undivided, double geminate figure	83
	Midfacial yellow typically narrow, rarely reaching to the sutures; apical spot narrow and sharply defined; an hour-glass-shaped spot on tergites 1 and 2, the black on 3 and 4 usually divided by a continuous narrow yellow line	84
83 -	An isolted black spot on either side of the median figure on tergite 2 .	*proclivis* Osten Sacken
	Sides of tergite 2 entirely yellow (widening of the apical spot often accentuated)	*proclivis imfurcata* Philip

84 - Lateral spots on tergite 2 isolated, yellow incisures on tergites 3 and 4 usually expanding narrowly to divide the black in the middle ..... *surda* Osten Sacken

Lateral spots on tergite 2 confluent with median figure leaving only narrow yellow, abbreviated "n"-shaped yellow markings laterally above; tergites caudad of 2 black with only narrow yellow incisures . *surda picea* Philip

85 - (61) Apical spot just wider than cell R_1 at its origin and only exceptionally expanded distally; about basal half and fourth of the respective two basal cells infuscated; frontal calosity customarily yellow with a brown upper margin, rounded and almost as tall as broad; tergites 1 and 2 yellow with a connected, sharp black hour-glass-shaped spot, not widest below, the enclosed yellow triangle on 2 usually equilateral; sternites 2 and 3 with sublateral spots ..... *sackeni* Hine

Not with this combination of characters 86

86 - Abdomen quadristriate or -vittate, usually with a median, inverted "V" on tergite 2; apical spot drop-shaped, usually half filling cell R_4, the apex of the yaline triangle often reaching or even slightly crossing vein R_{2+3}; frontal callosity and scutellum typically black but the former occasionally yellowish shades ..... *montana* (3) Osten Sacken

Not with this combination of characters 87

87 - Apex of hyaline triangle clearly reaching or crossing vein R_{2+3} 88

Apex of hyaline triangle not reaching vein R_{2+3} (first basal cell

(3) This variable species, as now considered, is probably composite but no lines of cleavage have been found to satisfactorily break it down in the females, as accomplished with the males and in the *striata-aberrans* complex.

with infuscation usually reaching to or beyond the basal two-thirds) ... 116

88 - First basal cell half or more (but never completely) infuscated 89
Both basal cells predominantly hyaline (infrequently a spur reaches middle of the first) 92

89 - Frontal callosity yellow; face and cheeks predominantly yellow 90
Frontal callosity black; face outside the lateral sutures and/or cheeks predominantly black 91

90 - Scutellum predominantly or wholly blackish; vertex bare, blackish; crossband continuous across base of cell Cu_1; thorax plainly striped [western U. S.] ..... *coloradensis* Bigot
Scutellum predominantly yellow vertex dull gray pollinose about ocelli; crossband ending in cell M_3 (fig. 5a); thoracic stripes indistinct [northern Mexico] ..... *dampfi*, n. sp. (syn. *pallida* Bellardi, not Macquart)

91 - Sides of tergite 2 with more or less prominent, isolated spots, the median geminate figure heavy, and not, or but little constricted anteriorly; fore coxae usually predominantly dark (mostly northeastern) ..... *furcata chagnoni*, subsp. nov.
Usually no sublateral spot on tergite 2, the median geminate figure horseshoe-shaped and constricted at its juncture with that on tergite 1; fore coxae usually predominantly yellow (mostly northern and western) ..... *furcata* Walker

92 - Discal cell with a large central fenestrate spot [Neotropical] 93
Discal cell infuscated like rest of crossband (or hyaline basally in *delicatula* and occasional *cursim*) . 94

93 - Thorax bright yellowish with distinct brown stripes its full length . *variegata* DeGeer
Thorax brownish red, with indistinct stripes anteriorly ..... *variegata subfascipennis* Macquart

94 - Apical spot a narrow or sometimes slightly expanded border along the costa into the apical corner of cell R_4 95

Apical spot much widened beyond its origin, more or less dropshaped and crossing into more than just the apex of cell R_4 107

95 - Crossband broad to hind margin with inner and outer margins subparallel, a small but sharply demarkated hyaline lunule in cell M_3 not extending into cell Cu_1 nor attaining the hind margin [Costa Rica?] ... *leucospila* Wiedemann

Crossband with a different pattern; if a hyaline spot in cell M_3 then it connects with one in Cu_1 96

96 - Crossband sharply forked or horseshoe-shaped posteriorly enclosing an extensive, contrasting, hyaline spot open behind in cell Cu_1 [Neotropical] 97

Crossband not sharply forked behind, though sometimes less dense in cell Cu_1, or an isolated shadow along vein Cu_2 105

97 - Hyaline spot enclosed by the fork of the crossband confined to cell Cu_1 98

This hyaline spot expanded into cell M_3 102

98 - Outer margin of crossband regular and even 99

Outer margin of crossband irregular with an angular extension along vein R_{4+5} toward the fork 100

99 - Thorax with prominent yellow pleural lines ..... *lacta* Fabricius

Thorax dark, no distinct lateral lines *latifusciata* Bellardi

100 - Abdominal pattern not quadrivittate *laeta tenuistria* Kröber

Abdominal pattern roughly vittate with four rows of irregular, sometimes geminate spots [Caribbean] .. 101

101 - Basal segments of antennae reddish-yellow; callosity black ..... *fraseri* Williston

Antennae entirely black; callosity yellowish-brown ..... *zayasi* Bequaert

102 - (97) Abdomen quadrivittate; outer margin of crossband with step-like offset along vein R_{4+5} ..... *scalarata* Bellardi

Abdominal pattern not quadrivittate although there is a median row of yellow triangles; outer margin may be sinuous, but not step-like 103

103 - Thorax dark, unstriped; hyaline in cell M_3 reduced ..... *melaena* Hine

Thorax with prominent yellow or grayish stripes laterally; hyaline crosses cell M_3 nearly or quite to the discal cell 104

104 - No median yellow triangle on tergite 2; apex of hyaline triangle not crossing vein R_{2+3}, or if so the apical spot continues narrowly; front taller than wide ..... *auroguttata* Kröber (= ? *incisa* Macquart)

Tergite 2 with a variable, median yellow triangle; hyaline triangle crossing vein R_{2+3} broadly so that apical spot is distinctly widened distally; basal width and height of front about equal ..... *pallidefemorata* Kröber

105 - (96) Crossband dilute, narrow, attenuated behind, leaving the proximal half of the discal cell and the entire inner margin of cell M_3 hyaline ... *delicatula* Osten Sacken

Crossband more saturate, often attaining the posterior margin or approaching it, filling the basal portion at least of cell M_3 and all of the discal cell 106

106 - A combination of: apical spot usually narrower than cell R_1 and more dilute than crossband, front little convergent at vertex, abdomen usually dull or grayish-yellow and black, and sublateral, black triangles on tergite 2 which may connect with the median inverted "V" ..... *aestuans* Wulp (4)

(4) [*aestuans confusa* Kröber differs only in complete lack of triangles on sides of tergite 2, and concomitantly reduced black on the rest of the abdomen].

Differing in more than one of the above — the apical spot often filling cell R_1 and of the same density as the crossband, front more convergent at vertex, abdomen usually brighter yellow, the median "V" often extended laterally but not usually forming triangles ..... *callida* Osten Sacken

107 - (94) All tibiae black and distinctly enlarged, especially the posterior ones; crossband broad, reaching hind margin of wing with outer margin evenly convex and separated from apical spot [Neotropical] ..... *pachycnemia* Hine

Not with this combination of characters; at least mid and hind tibiae normal 108

108 - Sublateral black triangles present on tergite 2, and the apical spot narrowly connected with the crossband in cell R_1 (abdomen never striate) 109

No sublateral triangles on tergite 2 beside an inverted "V", and/or the apical spot often separated from the crossband by the apex of the hyaline triangles in cell R_1 110

109 - Frontal callosity black; abdomen with yellow and black pattern [mostly midwestern U. S.] ..... *aestuans abaestuans* Philip

Frontal callosity yellow; abdomen with gray and black pattern, including sublateral rows of ovoid spots on tergites 3 to 5 [Central America] ..... *willistoni* Hine

110 - Apical spot less dense than crossband, widely separated from it and extending across apices of cells R_2 and $_4$; basal cells predominantly hyaline and Cu_1 entirely infuscated with a small hyaline spot at apex of M_3; tergite 4 with a wide yellow band across the apex [Mexico] ..... *engeli* Kröber (5)

(5) Study of the type in Munich Museum since this went to press confirms the suspicion that this is a synonym of *C. pachycnemia* Hine, and that Kröber was mistaken in figuring the hyaline spot in cell M_3 rather than Cu_1.

Not with this combination of characters 111

111 - Abdomen predominantly blackish with a long, middorsal yellow stripe attenuated caudad, and sometimes with abbreviated ones on either side *wiedemanni* Kröber

Abdomen predominantly yellow and otherwise patterned 112

112 - Apical spot practically or quite separated from crossband by the apex of the hyaline triangle 113

Apical spot joined to crossband by about the width of cell R_1 115

113 - Apical spot occupying about half of cell R_4 and crossband usually not reaching hind margin of wing; abdomen usually striate; robust species ..... *lateralis* Wiedemann

Apical spot occupying nearly the whole of cell R_4, and crossband filling cell M_3 to margin; abdomen infrequently striate; small, slender species 114

114 - Second tergite with a pair of submedian dashes ..... *geminata* Wiedemann

Second tergite entirely yellow ..... *geminata impuncta* Kröber

115 - Crossband rather dilute and bowed mesally; hind femora and frontal callosity yellow; median spots on tergites 1 and 2 very reduced ..... *cursim* Whitney

Crossband more saturate and usually with a straighter outer margin; hind femora and callosity usually fuscous; a conspicuous spot beneath the scutellum on tergite 1; the inverted "V" on tergite 2 heavier and often produced laterally ..... *pudica* Osten Sacken

116 - (87) Apical spot extended dilutely along whole hind margin of wing enclosing a subhyaline streak (sickle) along the outer border of the crossband; scapes enlarged; body rich brownish-red with indefinite abdominal pattern ..... *brunnea* Hine

Not with this combination of characters 117

117 - Apical spot broad basally, sharply demarcated, the hyaline triangle just enveloping the fork ..... [some *inda* Osten Sacken, see 70]

Apical spot originating nearer vein R_{2+3}, though the usual hyaline areas are often obscured by tinting and wing picture is often less sharp in outline 118

118 - The inverted "V" on tergite 2 tall, crossing the tergite and enclosing an equilateral triangle; hind femora and tibiae usually predominantly black; frontal callus only occasionally yellow ..... *dimmocki* Hine

The "V" usually flatter, when occasionally attaining the anterior margin the enclosed triangle is broader than tall, the frontal callus is yellow and hind femora and tibiae predominantly so 119

119 - Wing pattern distinctly outlined; basal segments of antennae but little swollen 120

Wing pattern not sharply outlined, the usual hyaline areas tinted; antennae moderately swollen but not to the extent in *brunnea* (mesonotum typically grayish-green with blackish stripes) ..... *atlantica* Pechuman

120 - Thorax typically yellowish with brown stripes; outer margin of crossband usually rather straight; inverted brown "V" on tergite 2 not especially flattened and sides of this tergite brownish-yellow ..... *flavida* Wiedemann

Differing in one or more of these characters, the outer margin of the crossband usually sinuous 121

(6) The *flavida* complex is undoubtedly comparatively young phylogenetycally and the characters in a state of flux so that the specific or subspecific differentiation here is still not satisfactory on purely morphological grounds because of much apparent intergradation as evidenced in the discussion by Pechuman (1949). The writer is not prepared to pass on the merits of recent names proposed at this time.

121 - Tergite 2 with median "V" flattened to about one-half the length of the tergite leaving an anterior "collar" of pale greenish-yellow; thorax with yellow and brown stripes *flavida reicherti* Fairchild

Tergite 2 not as above; thorax grayish-green with fuscous stripes. *flavida celata* Pechuman

KEY TO MALES OF NORTH AMERICAN *CHRYSOPS*

This sex for the North American species or subspecies of *Chrysops* in the preceding key to females is not certainly known or is unplaceable for the following: *hyalina, abata, auroguttata* (? = *incisa*), *balzaphire, bistellata, calogaster, celata, confusa, coquilletti, divisa, dorsopunctata, engeli, floridana, frazeri* (? = *frontalis* ♂), *imfurcata, latifasciata, leucosipila, luteopennis, mutata, nigroptera, parvula, proclivis, shermani, subfascipennis, tau, taylori, tristis, venus, willistoni, zayasi,* and *zinzala*. Conversely, though the males of *nubiapex* and *perplexa* are keyed below the females remain unrecognized.

1 - Central American species with smoky wings and crossbands fragmented by dilute vein margins in the wing pictures (7) 2

Crossband not normally fragmented or if suggested, the discs of cells not the vein margins are fenestrate ... 3

2 - Discal cell subhyaline with infuscated margins; cloud on the fork small; midfacial pollinose stripe nearly complete [Panama] ..... *alleni* Fairchild

Discal cell with a dark center; fork with a prominent quadrangular spot; midface bare [Guatemala] ..... ? *caloptera* Hine

3 - Entirely black, northern California species; eyes narrowly separated; no midfacial pollinose stripe, face densely hirsute and black with two submedian dark yellow stripes, but tubercles not usually swollen; wings hyaline along posterior border, and suggestions of a very narrow apical

(7) The unknown males of Nearctic *shermani* will probably have a fragmented crossband but a completely infuscated first basal cell.

	spot and of two subhyaline spots in the apices of the basal cells	*hirsuticalla* Philip
	Not such species	4
4 -	Apex of wing beyond crossband hyaline, at most an occasional indefinite trace of infuscation along costa ...	5
	"Apical spot" present and distinct .	13
5 -	Midface with gray, yellow, or orange pollinosity at least as a stripe on the upper half, usually more	6
	Midfacial pollinosity absent, or at most an attenuated spur less than half the distance to the oral margin from the base of the antennae	11
6 -	Sides of at least the first two tergites with integumental reddish or yellowish-gray areas	7
	Abdomen black, sometimes with patches of pale pubescence	8
7 -	Wing picture dilute and indistinct behind the discal cell; basal segments of antennae and hind legs yellowish-brown	*cuclux* Whitney
	Wing picture saturate below discal cell; antennae and hind legs predominantly blackish	*excitans* Walker
8 -	Cell Cu_1 with basal hyaline lunule ..	*carbonaria* Walker
	Cell Cu_1 infuscated basally	9
9 -	Some yellowish or brown pile on pleura; also on dorsum of abdomen, especially near the apex, and sometimes forming median triangles	[some *excitans* Walker]
	Thoracic and abdominal pile jet black	10
10 -	Grossband distinctly separated from posterior margin of wing; antennae reddish basally	*mitis* Osten Sacken
	Crossband attaining posterior margin of wing; antennae wholly black .	*celeris* Osten Sacken
11 -	(5) Wing picture saturate; face shining yellow in the middle	*nigra* Macquart
	Wing picture very dilute almost obsolete; face entirely black	12

12 - Abdomen and first basal cell entirely blackish ..... *nigribimbo* Whitney

Abdomen with a basal yellow pattern; first basal cell not infuscated . *fulvistigma* Hine

13 - (4) A Central American species with eyes barely contiguous, scapes only a little swollen, face yellow with brown spots on the lateral sutures, the median pollinose stripe only a shortened spur above; tergites 2 to 4 with double geminate figures; apical spots separated from the broad crossband; latter reaches the hind margin of the wing without enclosing a sharply outlined, hyaline spot in cell Cu_1 ..... *chiriquensis* Fairchild

Not with this combination of characteres 14

14 - Midfacial pollinose stripe complete or nearly so (rarely little more than half, or exceptionally, *clavicornis*, a short spur above the mouth only) and/or lateral facial tubercles often protuberant and scapes incrassate .. 15

Midface bare, or an abbreviated spur on usually much less than the upper half of the face; facial tubercles only exceptionally protuberant 43

15 - Apical spot joined along posterior border to crossband to enclose a subhyaline "sickle"; discal cell usually sub-hyaline or fenestrate; antennae and fore femora black 16

Hyaline triangle open to posterior border of wing (8); crossband infrequently lighter in discal cell and then antennae and fore femora not black 17

16 - Dorsum of abdomen quadrivittate; scape robust but not incrassate; lateral pollinose stripes joined across face above oral margin ..... *discalis* Williston

(8) In occasional *latifrons* (see 35) the apical spot is faintly extended along the hind margin, but the yellow fore femora and bases of antennae distinguish it.

Abdomen not quadrivittate; scape swollen, almost double the thickness of the pedicel; facial pollinose stripes not joined ..... *fulvaster* Osten Sacken

17 - Antennae not unusually incrassate nor face tuberculate; eyes contiguous 18

At least scapes swollen, and often the facial calli also; eyes narrowly separated and divergent above the frontal triangle (except *altivaga* of Mexico) 28

18 - Crossband with prominent tooth to fork ..... *nigripes* Zetterstedt

Outer margin of crossband with no such extension 19

19 - Abdomen black with small red lateral patches on tergite 2, suggestions of gray incisures above and below, widening into flat triangles on the dorsum; apical spot filling all of cell R_3 and indefinitely most of cell R_4; both basal cells with infuscation reaching tips ..... *sordida* Osten Sacken

Abdomen and wing otherwise 20

20 - Tergite 2 with sublateral black triangles which often connect with extensions from an inverted, median "V" [occasional *aestuans* and subsp. *abaestuans* see 70]

Tergite 2 not with sublateral black triangles 21

21 - Hyaline triangle produced across vein R_{2+3} to nearly or quite separate apical spot from crossband 24

Hyaline triangle not reaching vein R_{2+3} 22

22 - Hyaline triangle nearly crossing cell R_3 so that apical spot is just wider than cell R at its juncture with the crossband; abdomen yellow and black banded ..... *asbestos* Philip

Apex of hyaline triangle barely enveloping the fork; abdomen usually otherwise 23

23 - Face, legs, and often abdomen predominantly yellow ..... *frigida xanthas* Philip

Face and legs largely black ..... *frigida* Osten Sacken

24 - Abdomen reddish-yellow with a contrasting middorsal black stripe .... *dorsovittata* Hine

Abdomen predominantly or entirely black 25

25 - Both basal cells crossed subapically by a hyaline, diagonal dash 26

Both basal cells infuscated to their tips [eastern U. S. species] ..... *separata* Hine

26 - Crossband reaching posterior margin of wing or very narrowly separated; apical spot large, crossing vein R_4 just beyond fork 27

Crossband not reaching posterior margin; apical spot more reduced, just entering cell R_4 near upper corner ..... *noctifera* Osten Sacken [and subsp. *pertinax* Williston]

27 - (9) California species, 9 mm.; apical spot discrete; crossband bowed but hardly sinuate in cells R_3 and R_5 .. *pechumani* Philip

Eastern species, 7.5 mm.; apical spot diffuse in cell R_4; outer margin of crossband more concave in cell R_5 than in cell R^3 (Fig. 6c) ..... *carbonaria nubiapex,* subsp. nov.

28 - (17) Apical spot expanded to invade cell R_5 29

Apical spot terminating in cell R_4 or before 31

29 - Discal cell fenestrate [Neotropical] [some *variegata,* see 82]

Discal cell not normally lighter than rest of crossband [Nearctic] 30

30 - Tergite 2 with a pair of sublateral isolated spots, tergite 1 predominantly black not entirely crossed by yellow laterally ..... *clavicornis* Brennan

Tergites 1 and 2 broadly yellow laterally, the latter without isolated spots ..... *clavicornis brennani,* subsp. nov.

(9) Pechuman (correspondence) states a male of *C. amazon* he has from Mass. resembles *C. pechumani,* but the crossband is even more bowed outwardly, the anal area is distinctly more infuscated, and the two basal antennal segments are not black.

31 - Apical spot relatively narrow, at most just entering outer corner of cell R_4 at apex of wing 32

Apical spot broader, invading cell R_4 more extensively 34

32 - Second basal cell and Cu_1 for the most part hyaline ..... *dissimilis* Brennan

Second basal cell 2/3 infuscated, Cu_1 infuscated entirely across base 33

33 - Abdomen chiefly black with narrow yellow incisures; outer margin of crossband irregular but not sharply off-set along vein R_{4+5} ..... *affinis* Bellardi (syn. *gigantea* Kröber)

Abdomen with extensive yellow on sides; crossband with pronounced step-like off-set ..... *scalarata* Bellardi (syn. *apicalis* Bellardi)

34 - Discal cell fenestrate though sometimes restricted to a small central subhyaline spot 35

Discal cell not lighter than rest of crossband 36

35 - Crossband typically with tooth-like projection to the fork; apical hyaline spots in the two basal cells reduced and subequal, that in the second not entirely crossing the cell ..... *latifrons* Brennan

Crossband with no outer extension toward fork; apical hyaline spot in the second basal cell more extensive than that in the first, and resting broadly on the hind margin ..... *pachycera dilata* Rowe and Knowlton

36 - Flagellum with basal annulus (plate) longer than remaining annuli together; three contrasting hyaline spots in line distally in the two basal and anal cells ..... *virgulata* Bellardi

Not with this combination of characters 37

37 - Face black; wings completely infuscated basad of and including the crossband [Mexican species] ..... *altivaga* Osten Sacken

Not with this combination of characters 38

38 - Face with four more or less discontinuous black spots ..... *facialis* Townsend

Face yellow or infrequently with brown shadows not intensified at the sutures 39

39 - Second basal cell with basal infuscation diagonally decreasing along lower margin nearly to the base (fig. 5c) (midfacial pollinosity occasionally obsolescent); midventral black stripe shining and contrasting ..... *wileyae*, n. sp.

Infuscation in two basal cells subequal; midventral stripe often dull and not contrasting 40

40 - Outer margin of crossband jagged and with step-like extension to the fork; hyaline triangle with longitudinally widened apex in cell R_3 due to inward expansion of apical spot basad along vein R_4 [Neotropical] .. *subcaecutiens* Bellardi

Not with this wing picture 41

41 - Apex of hyaline triangle plainly crossing vein R_{2+3}; hyaline spot in cell Cu_1 restricted, not reaching anterior margin; tergite 1 black and 2 with double geminate dark figure . *coquilletti robusta* Brennan

Apex of hyaline triangle not crossing vein R_{2+3}; hyaline spot in cell Cu_1 usually (not always) reaching or crossing anterior margin into cell M_3; tergites 1 and 2 broadly yellow laterally 42

42 - Sides of abdomen broadly yellow with only the submedian double row of spots prominent ..... *pachycera* Williston

Abdomen quadrivittate from tergite 3 on ..... *pachycera hungerfordi* Brennan

43 - (14) Wing patterns dilute and indefinite, the whole apical area of the wing smoky enclosing the hyaline triangle, and the second basal cell is extensively hyaline; scapes robust to noticeably swollen 44

Wing patterns normally saturate, sharp and contrasting with definitive apical spot (in *bishoppi* the crossband may be dilute but the apical spot is relatively narrow and the second basal cell is completely infuscated along the hind margin); scapes occasionally robust but not swollen 45

44 - Reddish brown species with swollen scapes, very indefinite abdominal pattern, and an enclosed hyaline sickle beyond the crossband ..... *brunnea* Hine

Yellowish brown species with moderately robust scapes, a median series of indefinite geminate spots on the abdomen, and very indefinite pattern outwardly on the wing ..... *atlantica* Pechuman

45 - Apical spot includes practically all of cell R_4 often invading cell R_5 72

Apical spot narrower, seldom reaching beyond half of cell R_4 46

46 - Apical spot relatively slender and reaching narrowly into the apex of cell R_4, hardly widened beyond its juncture with the crossband 47

Apical spot noticeably widened beyond origin; sometimes separated from crossband, or broadly joined, and usually invading about half of cell R_4 (though hind margin is sometimes faint in this cell) 55

47 - Dark Neotropical species with reduced red spots laterally; crossband always reaching hind margin enclosing a sharply defined hyaline area in cell Cu_1 or more 48

Usually yellower Nearctic species, tergites 1 and 2 with broadly yellow sides and crossbands often abbreviated behind; when tergite 1 is black and the crossband reaches the hind margin, it does not enclose a sharply defined hyaline area in cell Cu_1 ... 50

48 - Thorax with yellow pleural stripes; no middorsal, yellow triangle on tergite 2 ..... *auroguttata* Kröber (?= *incisa* Macquart)

Thorax entirely dark, unstriped; a small middorsal triangle on tergite 2 49

49 - Hyaline spot in cell Cu_1 encroaching into the hind margin of cell M_3; yellow triangles on tergites 2 to 4 subequal in prominence ..... *melaena* Hine

Hyaline spot confined to cell Cu_1; abdominal triangles decreasing markedly on tergites 3 and 4 ..... *laeta* Fabricius

50 - Face entirely yellow though the pits may be blackish 51

Sublateral facial pollinose stripes margined with blackish 54

51 - Wing picture dilute, the apical spot usually short of apex of wing; tergites 3 and 4 with double geminate pattern [western U. S. species] .... *bishoppi* Brennan

Wing picture saturate, apical spot reaching apex of wing; tergites 3 and 4 often with median triangles and yellow sides but never in a double geminate pattern 52

52 - Apical spot a little wider than cell R_1 *sackeni* Hine

Apical spot at its origin not wider than cell R_1 53

53 - A pair of prominent sublateral black triangles joining the median figure on tergite 2; antennae usually black; cell Cu_1 often with extensive basal infuscation ..... *aestuans* Wulp

The inverted "V" on tergite 2 may be extended laterally but not usually in form of triangles; antennae usually basally yellowish; cell Cu_1 usually predominantly hyaline ..... *callida* Osten Sacken

54 - (50) The hyaline triangle crosses vein R_{2+3} ..... *delicatula* Osten Sacken

The apical spot fills cell R_1 ..... [some *surda* Osten Sacken, see 61]

55 - (46) Body without yellow markings; usually a definite cloud on the base of vein R_4 at the fork 56

Body with various yellow patterns; no cloud on the fork 57

56 - Outer margin of crossband noticeably bowed ..... [some *fuliginosa* Wiedemann, see 77]

Outer margin of crossband nearly straight ..... *brimleyi* Hine

57 - Sides of face and cheeks with large black spots or latter entirely black . 58

Face and cheeks entrely yellow 64

58 - Abdomen fuscous with a conspicuous middorsal yellow stripe attenuated caudad ..... *wiedemanni* Kröber

Abdomen with four rows of geminate or subquadrate black spots, or black with yellow incisures 59

59 - Tergite 2 with sublateral black spots on either side of the median geminate figure or predominantly black 60

Tergite 2 entirely yellow on the sides, or at most an indistinct shadow on either side of a geminate maculation 63

60 - Abdomen predominantly black with narrow yellow incisures; fore coxae entirely blackish 61

Abdomen vittate on a conspicuous yellow pattern; fore coxae yellow or occasionally with blackish shadows . 62

61 - Tergites 1 and 2 with narrow yellow sides; the latter and sternites 3 and 4 with sublateral yellow spots; pleura with 2 plumbeous stripes ..... *surda* Osten Sacken

Segments 1 and 2 entirely black except for a very narrow hind margin on tergite 2; upper pleural stripe beneath the wings obsolescent ..... *surda picea* Philip

62 - A double geminate black figure subtending from the anterior margin on tergite 2; face, cheeks, and fore and hind femora predominantly yellow, though there are black spots of

variable extent around the facial pits; palpi elongate ..... *coloradensis* Bigot

A pair of isolated black dashes on the sides of tergite 2 (fig. 7c); face outside the sutures, cheeks and fore and hind femora predominantly black; second palpal segment small, subequal to the first ..... *furcata chagnoni,* subsp. nov.

63 - (59) Tergite 2 with a pair of submedian isolated dashes; first basal cell and Cu_1 predominantly hyaline . *lateralis* Wiedemann

Median figure on tergite 2 geminate (fig. 7a); both basal cells and C_1 predominantly infuscated ..... *furcata* Walker

64 - (57) Second basal cell predominantly hyaline; base of cell R_3 often with a subhyaline spot (fig. 5a); abdomen pale yellow with often indefinite, light brown or fuscous markings, that on tergite 2 and inverted "V" usually not reaching anterior margin 65

Both basal cells predominantly infuscated; base of cell R_3 not usually paler than rest of crossband; abdominal pattern otherwise 69

65 - Ground color of thoracic dorsum and scutellum typically yellow 66

Ground color of these parts typically green-gray 68

66 - Apex of hyaline triangle terminating broadly on vein R_{2+3}; inverted "V" on tergite 2 upright, the sides forming an acute angle [Mexico] ..... *dampfi,* n. sp.

Hyaline triangle not reaching vein R_{2+3}; inverted "V" flat, obtuse, angulate 67

67 - Tergite 2 with broad greenish-yellow, basal band above a flat, broad, brown inverted "V"; outer margin of crossband strongly sinuous ..... *flavida reicherti* Fairchild

Base of tergite 2 about same color as the others, and the median figure usually taller; outer margin of crossband nearly straight or gently sinuous *flavida* Wiedemann

68 - Inner margin of crossband practically filling the discal and R_3 cells to their bases ..... *pudica* Osten Sacken

Inner margin of crossband dilute, the bases of the discal and R_3 cells extensively subhyaline ..... *cursim* Whitney

69 - (64) Tergite 2 with sublateral black spots 70

Tergite 2 on either side the median figure broadly yellow 71

70 - Hyaline triangle acuminate in cell R_3 above the fork; abdomen quadrivittate, the sublateral spots on tergite 2 isolated and linear, nearly crossing the tergite ..... *montana* Osten Sacken

Hyaline triangle usually broadly reaching or crossing vein R_{2+3}; abdominal pattern otherwise, predominantly dark, the sublateral spots on tergite 2 triangular and usually joined to the median figure ..... *aestuans abaestuans* Philip

71 - Hyaline triangle barely envelops the fork; second basal cell with a small apical hyaline spot ..... *inda* Osten Sacken

Hyaline triangle nearly crosses cell R_3; second basal cell extensively hyaline in the outer half ..... *dimmocki* Hine

72 - (45) Fork covered by a broad, outward extension of the crossband along vein R_{4+5}; apical spot extended along posterior border to enclose a restricted and irregular hyaline crescente which crosses into cell R_1 [Neotropical] ..... *mexicana* Kröber

Not with this combination of characters 73

73 - Body predominantly blackish, the abdomen sometimes with one or three obscure reddish stripes 74

At least the abdomen with an extensive yellow and dark pattern 80

74 - Abdomen with one middorsal yellow stripe attenuated behind; cell R_2

almost completely infuscated; fore coxae yellow; midface with a pollinose spur under the antennae about half the distance to the oral margin *upsilon* Philip

Not with this combination of characters, the midface bare or with a shorter spur 75

75 - Femora and fore coxae black; no suggestions of abdominal stripes and no yellow thoracic stripes though pleurae may have plumbeous markings 76

Femora and fore coxae extensively yellow; sides of thorax and often abdomen with yellow stripes 78

76 - Hyaline triangle sharply limited to apices of cells M_1 and M_2 (cell R_5 entirely infuscated) ..... *moecha* Osten Sacken

Hyaline triangle at least invading cell R_5 77

77 - Outer border of crossband relatively straight, the apex of the hyaline triangle crossing vein R_{2+3}; a small, isolted spot at the base of vein R_4 and definite hyaline spots in the apices of the basal cells ..... [some *brimleyi* Hine, see 56]

Outer border of crossband sinuous, sometimes connecting along vein R_{4+5} with a spot at the fork, thus isolating the diagonal dash in cell R_3 which represents the apex of the hyaline triangle; the whole apex of the wing and the apices of the basal cells may otherwise be tinted ..... *fuliginosa* Wiedemann

78 - A yellow stripe on each side of thorax above the wing base; hind margin of second basal cell plainly infuscated; anal area fumose 79

Yellow stripes confined to pleura; second basal cell not conspicuously infuscated along hind margin; anal area subhyaline ..... *dacne*, n. sp.

79 - Abdomen with one or three definite reddish-yellow lines ..... *obsoleta* Wiedemann

Abdomen dark, at most a trace of a median line on tergite 2 ..... *obsoleta lugens* Wiedemann

80 - (73) Wing entirely dark except for narrow subhyaline streaks-diagonally in parts of the apices of both basal cells and along the outer margin of the crossband enclosed by the fumose apex (fig. 6b); tergites 1-4 with a median row of geminate spots and narrower, sublateral lines which also may be geminate with the median ones (fig. 7d) ..... *montana perplexa*, subsp. nov.

Wing with hyaline areas more extensive, the hyaline triangle usually open to the hind margin; abdomen otherwise, usually striate 81

81 - Apex of hyaline triangle nearly or quite reaching vein R_{2+3} sometimes crossing it 82

Apex of hyaline triangle just enveloping the fork 88

82 - Apex of hyaline triangle expanded along but not crossing vein R_{2+3}; facial tubercles produced and prominent; discal cell fenestrate [Neotropical] ..... *variegata* Fabricius

Not such species 83

83 - Apex of hyaline triangle terminating in cell R_3; abdomen with two to four black lines 84

Apical spot quite or almost separated from crossband by extension of hyaline triangle into cell R_1; sometimes quadrivittate on tergites 2 and 3 but not striate 87

84 - Facial tubercles and cheeks predominantly dark-brownish to black, leaving a narrow midstripe of yellow 85

Facial tubercles and cheeks predominantly yellow, the lateral sutures narrowly darkened 86

85 - Lateral abdominal stripes incomplete; the second basal and Cu_1 cells pre-

dominantly hyaline; apex of hyaline triangle blunt in cell R_3 and serrated along outer margin with apical spot — *pikei* Whitney

Lateral abdominal stripes complete to tergite 1; second basal cell in the apex and Cu_1 in the base with reduced hyaline spots, i.e., these cells predominantly infuscated; hyaline triangle acuminate and crescentic .. — *sequax* Williston

86 - Hyaline triangle with blunt apex in cell R_3; cell Cu_1 predominantly hyaline ..... — *beameri* Brennan

Hyaline triangle acuminate and crescentic; cell Cu_1 predominantly fumose with a restricted hyaline spot basally ..... — (?) *hinei* Daecke

87 - Tergite 2 with two joined or divided, diagonal black dashes ..... — *geminata* Wiedemann

Tergite 2 completely yellow ..... — *geminata impuncta* Kröber

88 - (81) Abdominal pattern transverse; first basal cell hyaline in the apex . — [occasional dark *flavida*]

Abdominal pattern linear; first basal cell infuscated to apex ..... — 89

89 - Ground color of thorax and scutellum yellow ..... — *vittata* Wiedemann

Ground color of thorax and scutellum plumbeus ..... — 90

90 - Abdomen with a prominent, middorsal yellow stripe flanked by irregular, anastamosing black stripes ..... — *univittata* Macquart

Abdomen yellow with four separate black lines ..... — 91

91 - Apical spot not filling cells R_3 and R_4 to fork; if scutellum is reddish margined, it is apical; sublateral abdominal lines usually less prominent than submedian pair ..... — *stricta* Osten Sacken

Apical spot practically filling cells R_3 and R_4 to fork and usually a spur from crossband in cell R_5; scutellum often reddish margined laterally; four abdominal lines subequal in density ..... — *aberrans* Philip

Liochrysops, new subgenus (1)

Monotypic for the peculiar, bog-inhabiting *Chrysops hyalina* Shannon. In addition to the entirely hyaline wings, this dainty little deerfly is unique among Nearctic species in having an entirely bare face and cheeks (except for indistinct scattering hairs) which distinguishes it from *C.* (*Nemorius*) *vitripennis* Meigen of Europe. It also lacks the usual pollinosity on the back of the head and on pleural stripes as well, the entire body being subshiny and with sparse vestiture. The front is taller than wide, a further distinction from *Nemorius* Rondani. These characters also differentiate *Liochrysops* from the subgenus *Turanochrysops* Stackelberg (for *C. hyalipennis,* also a clear-winged Palearctic species). The antennal characters and eye pattern of *C. hyalina* are characteristic for *Chrysops,* but the habits appear to be quite distinctive.

C. nigribimbo and *C. fulvistigma* are the closest Nearctic relatives of *C. hyalina,* but both have at least faint wing patterns and lateral facial pollinosity, which is, in the writer's opinion, of more than specific significance, when considered with the unusual habits of the rare *C. hyalina.* It is both unfortunate and surprising that the male remains unknown considering that the few females have been taken flying feebly among grasses in their habitat, and not offering to bite the collectors. The only two localities so far to have produced the few known female specimens are bogs in Maryland and North Carolina. The Georgia records (Fattig 1946) are questionable, as at least one of the two records was based on *C. nigribimbo* as checked by the writer.

Chrysops amazon Daecke

This species has been reported from Massachusetts and New Hampshire, in addition to the type locality in the pine barrens near Browns Mills Junction, New Jersey. The Massachusetts record of Johnson (1925) is based on a male seen by the writer who agrees with Pechuman that it must be this species rather than *C. carbonaria* subsp. *nubicapex* described below. The species is obviously very restricted in its habitat.

Of special interest therefore is a female taken in Florida by T. H. Hubbell which is unquestionably a dark form of *C. amazon* to which species this specimen was assigned by Hine in 1928. It is strange that it has not been taken in the intermediate pine barrens in North Carolina, at least. This specimen shows the same divergence from the typical form as do Florida specimens of *C. celer nigroptera* Fairchild and *C. nigra taylori* subsp. nov.

(1) Gr., smooth + *Chrysops.*

Chrysops amazon hubbelli, subsp. nov.

Readily identified with *C. amazon* Daecke on the basis of the prominent apical wing spot and the bright orange pleural hair patches.

Holotype, ♀, 9.5 mm. Differs from typical *C. amazon* in the following particulars: Wings with the apical spot more extensive and definite in outline occupying a little over the upper half of cell R_4, the hyaline separation from the crossband narrower, the outer hyaline spots in the basal cells narrower, a mere diagonal dash, and the entire basal and anal areas otherwise infuscated, only a little lighter behind; vestiture of the legs entirely black except on the fore coxae, and of the body predominantly so, the pale hairs much sparser and more scattered; the scape distally, and the pedicel dark brownish.

"Liberty Co., Fla. Tsp 2 N., R. 7 W., Camp Torreya, IV-25-1924, T. H. Hubbell. 141". In the collection of the Museum of Zoology, University of Michigan. Named for the collector who has made incidental collections of many interesting American tabanids.

Chrysops auroguttata Kröber

Hine (1925) and some later students credited *C. incisa* to Central America, and Bequaert (1933) followed them in so assigning specimens from the Yucatan Peninsula, Mexico. Pechuman (1937) considered Panama material from the Trinidad River as being *C. auroguttata* var. *pallidefemorata* Kröber. I am following Fairchild (1946) who cites Bequaert as later believing that *C. incisa* is at present unrecognizable. Fairchild regard subsp. *pallidefemorata* as separable on a specific level, but decides on the basis of frontal and antennal characters that Panama specimens are better placed as *C. auroguttata* Kröber. Bequaert and Renjifo-Salcedo (1946) entertain the possibility that the last may ultimately prove to be a synonym of *C. incisa,* but assign no Colombia specimens to the last in discussion of the type locality.

Clarification of this complex is needed since both *C. auroguttata* Kröber and subsp. *pallidefemorata* Kröber are recorded from Trinidad (probably Trinidad River, Panama), and Fairchild mentions specimens with duplicate data having the wing patterns of both.

Allotype, ♂, 6.5 mm. Differs from description of the type ♀ in addition to the usual sex differences as follows: Palpi reddish brown, basal segments darker. Disc of notum and scutellum black. Yellow on sides of tergites 1 and 2 more extensive than figured, yellow middorsal triangles prominent, but only present on tergites 3 and 4; no yellow incisures evident on posterior segments above or below. Two basal cells two-thirds infuscated, with the hind bor-

der of the second entirely so. Hyaline spot in the lower crossband reaching about two-thirds across cell M_3. Legs dark brown to blackish, the fore and mid pairs with reddish shades distally on the femora and basally on the tibiae.

Mojinga Swamp, Canal Zone, 20 May 1952, "light trap." In the collection of G. B. Fairchild through whose courtesy the specimen was studied.

Chrysops balzaphire, n. sp.
(Fig. 1)

A variegated yellow and black, Mexican species with alternating spots of those colors across the face and a median stripe of yellow pollen; transverse front and narrow, protuberant, semi-lunar, yellow and black callosity; black antennae with moderately enlarged scape

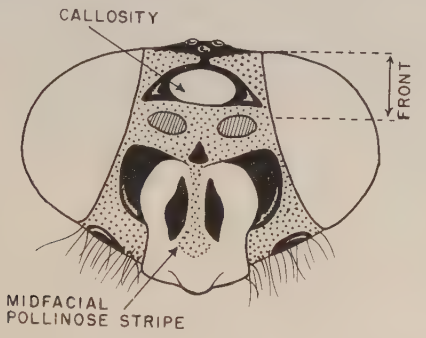

Fig. 1 — Head of *Chrysops balzaphire*, n. sp. ♀ illustrating front above antennal sockets wider than tall, callosity yellow with black margins, and midfacial pollinose stripe flanked by black and yellow bare spots.

(often narrowly yellow in the inner face); variegated legs with mostly black fore coxae and femora; quadrivittate abdomen; and a drop-shaped apical spot almost separated from the crossband.

Holotype, ♀, 7 mm. Eye pattern (relaxed) with occipital border contiguous with the ocular margin, and heavy shaft of arrowhead coalescent above with both the border and upper spot, arrowhead joined to round frontal spot but not to border below, upper and lower spots narrowly separated from frontal border. Front buff pollinose, slightly divergent below where it is a little wider than high. Ocellar spot bare, black, almost as wide as vertex and narrowly joined below to the callosity. Latter shallow, protruding, crescentic

with acute lateral angles, black on the lateral and upper margins, yellown on the disc and below, a few sparse short hairs laterally. Palpi blackish, a yellow streak anteriorly. Facial tubercles not especially swollen, a black stripe outside and yellow one inside the lateral sutures; another black one on each side the median half stripe of yellow pollen. Lateral yellow stripes of pollen complete to oral margin, cheeks black.

Thorax black on the disc, plumbeus anteriorly, with yellow pile, a yellow-gray lateral stripe above the wing base, and the usual ones of same color on the pleura; scutellum black. All coxae black. Fore pair of legs black, a narrow reddish ring on the base of the fore tibiae; mid-pair yellow with contrasting black on joints and on basal fourth of the femora, basal half of tibiae, and entire metatarsi. Wings with the usual infuscated pattern distributed as follows: basal three-fourths and apex of first basal cell, basal one-half of the second basal cell extending forward diagonally along the fore margin; crossband almost reaching hind margin in cell M_3, and extending across base of cell Cu_1 and apex of anal cell; outer margin of crossband with a halo; apical spot practically separated from crossband by the blunt, rounded apex of hyaline triangle, and widened posteriorly in cell R_3, crossing vein R_1 about midway to occupy upper margin of cell R_4.

Abdomen bright yellow with a quadrate spot under the scutellum, a heavy geminate spot on tergite 2, four rows of large spots on tergites 3 to 5, the incisures yellow and dividing the basal black in the middle (on tergites 6 and 7). Venter reddish gray with pale incisures, and median and smaller lateral maculations on sternites 1-5, black basally across 6 and 7.

El Salto Diego, Durango, Mexico, 29 May 1937, 9300 feet, J. Manuel. In collection of the author through courtesy of Dr. L. L. Pechuman.

Paratypes, 6 ♀'s, same data, in collection of Dr. Pechuman.

This is very close to *C. facialis* Townsend and was so listed by Pechuman (1949), but comparison with five specimens of the latter from various points in Arizona shows this to differ constantly in several darker features, notably the antennae, the forelegs including coxae, the bases of mid and hind femora and hind tibiae on distal half, and in the diagonal, not truncated, infuscation in the second basal cell. The apex of the hyaline triangle also is usually narrower between the apical spot and crossband and the hyaline area in the distal half of cell Cu_1 is usually more definite. The hind femora vary from one-fourth to two-thirds yellowish and the fore femora

may have yellowish median shades. The sublateral spots on tergite 3 are missing in one paratype. The maculations on tergites 3 and 4 may be double geminate or completely divided by yellow intervals. Pechuman observed some of these differences but considered them variations of *facialis*. The writer is not in doubt about the specific difference though obvious phylogenetic relationship of these two. The unknown male will probably be much darker with a much broader apical spot than that in *facialis*.

Chrysops carbonaria Walker

There is no need to reiterate the variation in intergradation of female characters discussed in this complex by many authors including the writer (1931) and Pechuman (1949). The type from Nova Scotia in BMNH was confirmed by the writer to have a bowed crossband outwardly not reaching the hind margin of the wing; the pleural hairs are straw yellow. As now considered, the species is undoubtedly composite and the synonymy complicated with only meager hope for early clarification through rearing and greater accumulation of materials. The form with extensive infuscation in the second basal cell, and straight margined crossband to the hind margin of the wing is particularly noticeable in Georgia and Florida where the wing picture is especially dark. Ricardo's (1901) remarks on Walker's types in the British Museum indicate that this *C. provocans* from Cape Breton (type now lacks both wings, Philip 1942) would be revived if this form is eventually separated, but the lines of cleavage are certainly not apparent at this time; both Daecke (1906) and Brennan (1935) figured this. *C. fugax* Osten Sacken has the bowed, abbreviated crossband of the typical form, as figured by Kröber (1926).

The extreme melanism exhibited by males of species related here often makes assignment difficult; nevertheless the hyalinity or infuscation of the apical areas remains mostly constant and reliable. In many captured and reared males of *C. mitis* from various localities there are no traces of apical spots. The same is true of *C. celeris*. The apparent exception in eastern *C. carbonaria* males therefore merits review. The writer has three from Connecticut and New Jersey (one on the same pin with a *provocans* type female) in which the wings are entirely clear apically, and he has seen others. He has three others from western New York with distinct and broad apical spots which have been labeled variously as *carbonaria, amazon,* and *celeris,* and which require individual keying, and for this reason are provided with a separate name in the absence of knowledge of what females should be associated.

Chrysops carbonaria nubiapex, subsp. nov.
(Fig. 6c)

Holotype, ♂, 7 mm. Head, body, appendages and hair black; dark brownish shades on sides of the venter, hind metatarsi, and knobs of the halteres; a few inconspicuous yellow hairs intermixed on the chest, fore coxae, terminal tergites and sides of the venter. Wings with diagonal streak across tips of basal cells just encroaching in base of Cu_1; outer margin of crossband irregular and fading just short of hind margin; apical spot diffuse behind in cell R_1, and in narrow costal juncture with crossband in cell R_1.

Little Valley, N. Y., 19 June 1937.

Paratype males — 2, Ithaca, N. Y., 26 May 1933, and 18 June 1916, S. H. Emerson; 1, "C. U. Exp. N.º 1043 Sub. 278" (reared, Cornell University by Alan Stone); 1, Albany, N. Y., 22 May 1930, N. K. Bigelow, and Oswego, N. Y., emerged 15 May 1947, C. Logothetis, n.º 1936 (in Philip and Pechuman collections). 1, N.º "10" (no locality), in Kans. U. det. as *C. amazon* by Brennan.

Compared to the other *carbonaria* males without apical spots, these have entirely black antennae, the body and hind tarsi with less brownish shades, fewer pale hairs on the abdomen, the hyaline streak across the basal cells and in base of Cu_1, is more reduced. They are much like *C. amazon* (which will likely be very close to *C. pechumani* when eventually discovered except for fortunate geographic separation) and the locality in New York is wrong according to Pechuman who has paid particular attention to *C. amazon* in that whole area. *C. celeris* males are also more robust on the average, and lack any indication of apical spots or of hyaline at the base of cell Cu_1. There seems to be no species other than the *carbonaria* complex with which these males could be associated, and yet it is more likely that the coastal males with no apical spots and larger lunules in the cubital cells are to be associated with the typical form from Nova Scotia and its synonyms from Cape Breton and Maine.

It is difficult to understand how this form and the one without apical spot could both have come from the less common type of *Chrysops* larva without terminal spine described by Stone (1930). It is possible that one element in *C. carbonaria* "sens lat." will be found to have larvae with the more typical stigmatal spine seen in *C. mitis*. More biological observations are badly needed and should eventually elucidate the biological relationships of subsp. *nubiapex*. Until such time as that reliably happens, the name will have served a useful purpose, compared to keying it as "*carbonaria*"? as was the original intention to avoid continued confusion with *C. amazon*.

Chrysops celeris Osten Sacken

Study of the type in the British Museum of *C. cincticornis* Walker (of which the antennae are gone and the thorax soiled) and comparison of specimens removes the doubt raised by Ricardo (1901) of synonymy of this prior name. However, since Osten Sacken's later name has been the established and only used name, the writer has requested an opinion of the International Commission whether the Principle of Conservation (of scientific names) recommended at Copenhagen can be applied here to circumvent this replacement.

Chrysops atricornis Walker

This name rests on a male and female cotype each, of different species in the British Museum. An opinion has also been requested of the International Commission regarding application of the above mentioned Principle of Conservation of the established name *C. bishoppi* Brennan if the male cotype is designated as lectotype, in view of the facts that (a) the female cotype has been wrongly synonymized with the prior *C. proclivis* O. S. following Ricardo (1901) and (b) the female cotype was inadequately described by comparison with the first described male. Of the two, the male is the only one carrying the original Bigot label from "Colorado?" which as Mr. Oldroyd has called to my attention is meaningless in view of his many mistakes in other locality labels. This specimen could as easily have come from California which is more typical of *C. bishoppi*. The status of Walker's *C. atricornis* therefore cannot be settled at this time.

Chrysops coloradensis Bigot

Ricardo's (1901) reference to and redescription of the female "type" of this "mixed species" in BMNH perhaps can be assumed to be the equivalence of lectotype designation, in spite of her reference (correctly) to the "type" male and other females of the type series as referrable to *C. fulvaster* O. S. As both specimens are still labelled as type, the female is herewith designated as lectotype to avoid ambiguity.

Chrysops incisa Macquart

Kröber (1934) includes Mexico and Costa Rica in this catalogued distribution. Fairchild (1942) listed specimens from Panama but pointed out (1946) the confusion that has existed regarding identity of this species. It is strange, therefore, that the cotypes in the British Museum have not been consulted. Each of the three now

present represents a different species, but the important one with Macquart's and Bigot's hand labels and in best agreement with the description, is the same as *C. brasiliensis* Ricardo, the type of which is also in BMNH. The latter species does not fall within the scope of the review but Fairchild writes that references to it in the literature are now entirely clear and free from involvement of other names. On the other hand, *C. melaena* Hine, to which the second syntype is referrable, has been a clearly distinguished species found from Costa Rica to Colombia and Venezuela (Fairchild, 1942b). The third syntype represents a species not identified with any species known to the writer. The logical and best course, as concurred by Fairchild, is to designate the authentically labelled specimen as lectotype thus reducing *C. brasiliensis* to synonymy but preserving the more certainly established *C. melaena*. *C. neglectus* Williston has been wrongly synonymized here.

Chrysops clavicornis brennani, subsp. nov.

A bright yellowish species of the *pachycera* group with wide front and callosity, moderately swollen antennae and facial tubercles, wide apical spot invading cell R_5, and a double row of submedian black spots on the abdomen but the sublateral rows not initiating before tergite 5.

The female differs from the typical *clavicornis* in that the abdomen has only a double row of divided dashes on tergites 2 to 4 inclusive (those on 2 widely separated from the anterior margin and not geminate), and sternite 2 entirely or mostly yellow, the infuscation in base of the second basal cell often less than half that in the first, and the hyaline spot in cell Cu_1 more than half the distal area. The midfacial pollinose stripe is incomplete below and in one specimen also broken in the middle. The scape of the antenna shows the characteristic bottle shape. The male also differs in more extensive yellow on the sides of tergites 1 and 2, the latter without sublateral spots, and the fore femora and hind tibiae only slightly darkened apically.

Holotype, ♀, 7.5 mm. Springdale, Nev., 27 June 1950, C. B. Philip, on horse.

Allotype, ♂, 7.5 mm. Lone Pine, Inyo Co., Calif., 31 June 1937, A. P. Yerington.

Paratypes, 2 ♂, Lone Pine, Inyo Co., Calif., 1 and 5 June 1937, N. W. Frazer; 2 ♂, 1 same and 1, 14 and 16 June, Gillogly, Aitken, Cazier, Van Dyke (1 ♂ "Alabama Hills"); 4 ♂, 7 ♀, Deep Spr., Calif., Inyo Co., 15 to 17 July, 1953, N. Malley, R. M. Bohart.

E. L. Schlinger and W. D. McClellan; ♂, Independence, Inyo Co., Calif., 14 June 1937, Gillogly; ♀, Cartago, Inyo Co., Calif., 15 July, 1953, R. M. Bohart; ♀, Bishop, Inyo Co., Calif. 20 June 1929, Van Duzee; ♀, foot of Cajon Pass, San Bernardino Co., Calif., 11 June 1941, Van Dyke; 2♀, Beatty, Nev., 26 May 1940, G. E. Bohart; 2♀, Lone Pine, Calif., 28 July 1940, R. H. Beamer and 20 June 1937, T. W. Johnson; 3♀, Lone Pine, Calif., 13 July 1953, W. D. McClellan. In the collections of the Museum of Comparative Zoology, California Academy of Sciences, the Universities of Kansas and California, and the author.

Chrysops coquilletti Hine

(fig. 5b)

As pointed out by Brennan (1935), the original cotype series was composite, containing a pair of his *C. clavicornis,* and only one female remaining was what he considered to be true *C. coquilletti* and designated as lectotype. However, specimens subsequently assigned to this species have also turned out to comprise two species, of which the less common form, without a definitely assignable male as yet, is the one which agrees by comparison with the lectotype though Brennan's description includes both forms.

The lectotype is typically a duller brownish yellow, more hirsute and apparently less common fly, with a differently shaped hyaline triangle and duller midventral stripe than the new species separated in the key and described below as *C. wileyae.* The narrowed apex of the triangle, due to the sinuous outer margin of the crossband in typical *C. coquilletti* and which crosses bluntly into cell R_1, is like *C. robusta* Bren., but the markings on tergites 1 and 2 are not double geminate and the figure on 2 is often divided. The base of cell R_3 and the upper portion of the discal cell often show subhyaline streaks in the crossband.

It is unfortunate that material of this complex is so slow to accumulate for adequate comprehension of variation. Nevertheless, it is now the writer's opinion that *C. robusta* Bren. is really a melanistic variant of *C. coquilletti* Hine as restricted above by Brennan's lectotype. A specimen from J. N. Belkin from Los Angeles County is intermediate with only lateral shadows on tergites 1 and 2; the figures from 3 to 5, however, are double geminate as in subsp. *robusta.* Another, from Saticoy, has a double geminate figure on tergite 1 but not on 2. The halation in the discal cell is reduced to a mere streak. However, the wing pattern appears to offer less variable diagnostic characters than that of the abdomen. The observed intergradation parallels the relation of *C. pachycera* Williston to subsp. *hungerfordi* Brennan. It is entirely possible that

all males will have the double geminate figures on tergites 1 and 2 now associated with subsp. *robusta*. But so far only 2 males of the last are known to the writer, one taken by him, with a female in the Lynwood suburb of Los Angeles, September 1917, and the allotype. A probable third male in the University of California collection has the blunt apex of the hyaline triangle terminating at vein R_{2+3}, and the yellow intervals of the bigeminate abdominal pattern more accentuated. In this, the infuscation in the second basal cell is subequal to that in the first, while in the females it is a little less, but does not recede diagonally to the degree seen in the females of the following new species. Here again, Brennan was differentiating his male *C. robusta* from *C. coquilletti* of authors (not Hine) (=*wileyae* n. sp.) not the true *C. coquilletti* as established by his lectotype.

Chrysops wileyae, n. sp.
(Figs. 2b, 5c, 7b)

A bright-yellow-bodied, not unusually hairy, quadrivittate fly of the *pachycera* group, having front broader than tall and strongly divergent below, a compressed, inflated, laterally attenuated frontal callosity, swollen scapes and facial tubercles, and a shining, contrasting black midventral stripe.

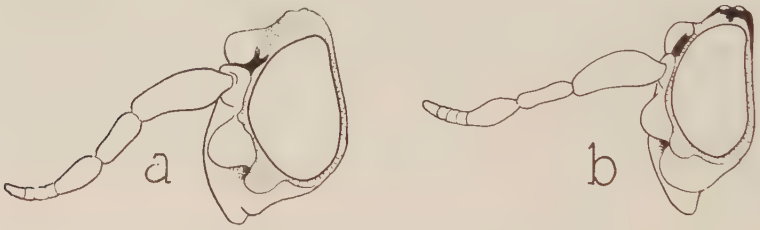

Fig. 2 — Profiles of heads of : *a, Chrysops coquilletti* Hine ♀ ; *b, C. wileyae*, n. sp. ♀ showing swollen frontal and facial tubercles, and antennal scapes.

Holotype, ♀, 7.5 mm. Eyes (relaxed) with occipital border and upper and lower spots contiguous to the ocular margin, the shaft of the arrowhead joining both the first two in the upper corner, and the arrowhead connected to the median spot but not extended below. Front yellowish gray pollinose, the ocellar callus large, shining black and narrowly separated from the callosity, which is yellow with dark outer corners, and a very narrow upper margin. Face and cheeks yellow with the usual three pollinose stripes, but none reaching the oral margin, the median one narrow and attenuated about three-fourths the length of the face. Antennae

robust, yellow, the flagellum a little longer than the scape and black beyond the basal annulus; scapes swollen, but not bottle-shaped; pedicels hardly thicker than the flagellums. Second palpal segments also robust, shining yellow with an anterior, dull yellow, bare marking.

Thorax greenish yellow with three dark stripes, the middle one narrowest; the usual yellow pleural stripes present. Scutellum blackish. Legs, including fore coxae, yellow, blackish at the joints, apices of fore femora, and all tarsi. Wing picture as figured, the hyaline triangle wide to the apex, not crossing into cell R_1, the infuscation in second basal cell not quite reaching outwardly that in the first along the upper margin but receding very diagonally behind, toward, or into, the base of the cell (in *C. coquilletti* this is more truncated distally), and cell Cu_1 with a sharply demarcated, hyaline apical spot not encroaching into cell M_3 as in *C. latifrons,* on either side of which the crossband reaches the hind margin of the wing. Crossband not paler in the discal nor R_3 cells. Halteres yellowish.

Abdomen bright yellow, quadrivittate on tergites 3 to 5 inclusive, a pair of heavy, submedian spots on tergite 2 narrowly separated by the yellow incisure from an emarginate spot on tergite 1 about the width of the scutellum, and narrow black stripes on the extreme under edges of both tergites. Venter with a bright black longitudinal stripe which widens behind to about one-third of sternites 3 and 4; sternites 6 and 7 predominantly black.

Mt. Wilson, Los Angeles County, California, 22 June 1946, R. M. Bohart.

Named in honor of Mrs. Grace Wiley, friend and herpetologist, who died recently at her southern California museum as a victim to her love of snakes, including the Indian cobra that finally struck her (see Natural History, November 1951), and who has in the past collected several interesting horseflies, including the types in Texas of the interesting *Tabanus quaesitus* Stone.

Allotype, ♂, 7.5 mm. Essentially like the female except for the usual sex differences, the wing pattern in basal cells, crossband and apical spot closely duplicating the holotype. Eyes very narrowly separated. The narrow, midfacial pollinose stripe complete to the oral margin. Antennae a little darker than in the holotype. Thorax a little more hairy and stripes less plain. Dark figure on tergite 1 wider basally than scutellum and continuous with a heavy geminate figure on tergite 2 which reaches the hind margin and encloses a much reduced median triangle, that on tergite 3 also geminate but

not connected to the lateral spots, the narrow marginal stripes complete. Midventral stripe equally bright, but more parallel sided.

1-1/2 miles W of Perris, Calif., from *Cryptocantha intermedia,* 4 May 38 - Timberlake from F. R. Cole.

Paratypes: ♂ Marin Co., Calif., 8-3-29, R. H. Beamer; ♂, Poway Valley, San Diego Co., Calif., 4-12-1930, C. H. Martin; 2 ♂, San Diego, Calif., 10 and 16 May 1903, E. P. Van Duzee; 2 ♂, Brey, Calif., June 30, Oman and R. H. Beamer; ♂, Truckee, Calif., 17 August 1939, Carl T. Sierra; 2 ♂, ♀, Agoura, Los Angeles County, Calif., 2 August 1949 and 30 June 1950; ♂, La Jolla, Calif., VII-13-41, R. H. Beamer; ♀, Lindsay, 25 June 1909, ♀, Davis, Calif., 23 May 19, Herms; 2 ♀, Dulzura, San Diego Co., Calif., 15 May 1917, ("*C. coquilletti*" det Brennan); ♀, Del Mar, Calif., 2 June 1935, Oman; 5 ♀, Tanbark Flat, Los Angeles Co., Calif., 25 June 1950, 5 and 8 July 1952, A. T. McClay, R. M. Bohart, and H. L. Mathis; ♀, Los Angeles Co., Calif., April, Coquillett (probably an original cotype of *C. coquilletti*); ♀, La Laguna, Sierra Laguna, Lower Calif., X-14-41, Bohart and Ross; ♀, Dales, Calif., 6-28-35, R. H. Beamer; ♀, Todos Santos, L. Calif., 12 August 1914, J. R. Slevin; ♂ ♀, San Fernando, Lower Calif., VII-13-38, Michelbacker and Ross; ♀, Zion Natl. Park, Utah, A. M. Woodbury; ♀, 11 mi. N. Glendale, Utah, 11 July 1934, Knowlton and Smith; ♂, "El Taste", (Mexico ?); ♂, Catarinas, Chihuahua, Mex., 5800 ft. VII-24-47, G. M. Bradt.

In the collections of the U. S. National Museum, American Museum Natural History, University of California (Berkeley and Davis), California Academy of Sciences, Kansas University, Museum of Comparative Zoology, J. N. Belkin, L. L. Pechuman, and the writer.

It is evident that Brennan (1935) described and figured mainly this species in differentiating his *C. robusta.* The practically straight, rather than sinuous, outer margin of the crossband, termination of the wide apex of the hyaline triangle at vein R_{2+3}, and contrasting black, midventral stripe, distinguish *C. wileyae* from *C. coquilletti.* In all the males of the former, and most of the females, the median figure on tergite 2 is geminate and reaches the anterior margin. In one Utah and Lower California paratype each, the infuscation is much reduced in the second basal cell, and the ventral stripe in the other Utah specimen is markedly widened caudally. The bright, contrasting body colors are only infrequently approached in true *C. coquilletti.*

More material is needed to compare occurrence, but at present it appears that *C. wileyae* is more widely spread than *C. coquilletti* in the southwest, and is earlier on the wing.

Chrysops dacne, n. sp. (1)

Assignment of the name *lugens* in *Chrysops* has been much confused in American literature up to the time of the establishment of the true nature of *C. obsoleta* Wiedemann by Kröber (1926) and separation of his *C. wiedemanni* as the species to which *C. obsoleta* customarily had been misapplied. It is obvious that the earlier writers had misidentified the true *C. obsoleta* as *"lugens"* and the two biological elements were not fully separated until the revisions of Kröber and of Brennan (1935).

The discovery (Philip, 1950) that the type of the real *C. lugens* in Copenhagen Museum has "infuscation of basal cells and hyaline triangle as in *obsoleta;* thoracic stripes yellow bordered as in *obsoleta,* but with no distinct gray middle band; no distinct vestiges of abdominal stripes, no pollinose spots; pattern (yellow and black) on legs as in *obsoleta*" (Tuxen, correspondence and comparison with males of *C. obsoleta* and *C. fuliginosa* forwarded to him), indicates also that this name has been misapplied and should properly be the prior name for *C. obsoleta* subsp. *ultima,* a conclusion based on this information with which Pechuman (correspondence) is in concurrence. This information was not available at the time the writer reduced *C. ultima* (Philip 1950).

The *"lugens"* of Kröber (1926) and Brennan (1935) is therefore without a name, but its specific validity within the *obsoleta-parvula* group is still somewhat in doubt owing to (a) some observed intergradation of characters, variation which bothered Daecke (1907) in particular, and (b) the lack of any acceptable males of *C. parvula.*

The complex is probably still young phylogenetically and the characters are as yet somewhat plastic. There will undoubtedly continue to be specimens that cannot be assigned satisfactorily in this complex. Nevertheless, the writer is not in disagreement with previous intensive students of the family that at least two species are involved here. Although Osten Sacken (1878) included variations in his description of *C. morosus* and included comment on the thorax — "lateral stripes yellowish (in some specimens they do not exist)", — plus a variable abdominal pattern, and in spite of the fact that the one specimen of his cotypes which he labelled "type of description" has been assigned in MCZ to *"lugens"* of authors, the name is not available because of the establishment of a different, but supposedly more characteristic lectotype by Fairchild (1938) which now irrefutably synonymizes the name with *obsoleta* Wiedemann. Though the description of *C. trinotata* Macquart is vague as Osten

(1) Latin, a biter.

Sacken points out, the lateral yellow lines on the thorax above the wing bases also eliminate this name for use here (1).

The following description of *C. dacne* for this unnamed but well-recognized element is therefore offered with full cognizance that a future reviewer with more adequate material, including the males of *C. parvula,* may decide it is only a subspecies of the latter species. The previously claimed differences of size, eye pattern, apical spot, and hind-femoral infuscation have not been completely substantiated, though in groups of characters the two seem to be specifically distinct. Certainly the differences in males confirm its distinctness from *C. obsoleta* Wiedemann.

The eye pattern appears not to be too trustworthy in relaxed specimens, and the only specimens with a horseshoe-shaped frontal spot (Daecke, 1907) and separated occipital margin characteristic of topotypic *C. parvula* that I have seen are a cotype and three other New Jersey specimens plus two Georgia specimens, while some other small, darker Georgia and Florida specimens with extensively or completely black faces that look like *C. parvula* have eye patterns that relate to those of *C. dacne* and *C. obsoleta.*

The complex is an important eastern one with vicious biting habits, and therefore the writer has decided not to delay longer in providing a referable name to this recognizable element in the complex. *C. parvula* appears to be more restricted in its distribution on the Atlantic seaboard.

Holotype, ♀, 7.5 mm. Eye pattern (relaxed) occipital margin contiguous, other spots separated from ocular margin and from each other, frontal spot ovoid, not emarginate in front. Front taller than wide, greenish yellow pollinose, the callosity protuberant, subovoid, piceous, and connected by a narrow line to the concolorous ocellar area above. Face narrowly shiny yellow in the middle, a brown spot above the oral margin, the lateral callosities and genae black, separated by the usual, two complete yellow pollinose stripes. Scapes yellow, pedicels and extreme bases of flagellums brown, remainder of antennae black. Palpi fuscous.

Thorax cinereous with a wide plumbeus, middorsal band, accentuated anteriorly, but with the only yellow stripes on the pleura; scutellum concolorous with the mesonotum, a brownish suffusion on the apex. Wings with first basal cell infuscated, the second hyaline, crossband with outer margin strongly bowed and complete to hind margin of wing in cell M_3, cell Cu_1 hyaline except for a faint shadow across the apex, apical spot extensive invading cell R_5 and enclosing a small, subhyaline area above the fork. Legs

(1) After this article went to press, the writer confirmed the synonymy of *C. trinotata* with typical *C. obsoleta,* though the abdomen of the type in BMNH is now broken.

yellow, the distal half of the fore tibiae and tarsi, the basal third of the midfemora, and basal two-thirds of the hind femora dark brown.

Abdomen deep brown, sides of the first two segments with indefinite yellowish shades, an acute, narrow yellow triangle middorsally on tergite 2, not reaching the anterior margin, behind which is a faint, incomplete, yellowish pollinose streak on each of the third and fourth tergites. No vestiges of sublateral stripes.

Clarke Co., Ga. 22 May 1938. Horace O. Lund.

Allotype, ♂ - 7 mm. Differs from the holotype ♀, in addition to the usual sex differences, in a narrow, complete, midfacial yellow pollinose stripe, darker thorax with the two yellow stripes on each pleuron being the only ones in evidence, abdomen almost completely fuscous with only suggestions of median, faint yellow pollinose dashes on tergites 2 to 4 in certain lights, and the apical spot of the wing less extensive with only a shadow in cell R_5. The wing is very lightly tinted (subhyaline) in the whole anal area to the crossband, and the hind margin of the first basal cell. The second basal cell with no plain infuscation along its hind margin.

Nassau, Del. 16 June 1938. Donald MacCreary.

Paratypes. *Connecticut* — 2♀, So. Meriden, 29 June 1938, H. L. Johnson.

New York — 3♀, Mahopac Falls, 5 June 1936, ♀, Brewster, 19 July 1938, ♀. Putnam Co., 7 July 1938, all by L. L. Pechuman.

New Jersey — 5♀, Browns Mills, 12 July 1936 and 4 July 1938, L. L. Pechuman; ♀, Ramsay, 20 July 1934; ♀, Newfoundland, July 6; 2♀, Collier's Mills, 25 July 1944, J. N. Belkin; ♀, Lakehurst, 23 July, Wm. T. Davis; ♂, New Brunswick, 1 July, J. A. Grosbeck; 3♀, Bamber, 1 Sept. 1905, 9 July 1906, E. Daecke; ♀, Trenton, 5 July 1906, E. Daecke; ♀, Long Branch, June 12, C. W. Johnson.

Pennsylvania — 2♀, Harrisburg, 26 June 1909, Daecke.

Virginia — 4♀, Boykins, 11 June 1895, C. W. Johnson; ♀, King Wm. Co., July 1908, C. W. Johnson; ♀, Dead Run, 23 June, Banko; ♀, Glencarlyn, 11 June 1916, W. L. McAtee.

Delaware — 3♂, 2♀, Same data as allotype; 2♀, Dover, 30 June 1939, R. Traub.

Maryland — 9♀, Plummer's Island, 27 June 1909, W. L. McAtee.

Washington, D. C. — ♀, 22 June 1911, Wm. T. Davis.

North Carolina — ♀, Southern, Wake Co., July 1907, L. M. Smith; 2♀, Raleigh, 5 June 1902, E. Daecke.

South Carolina — ♀, Raleigh, 21 June 1935, C. S. Brimley; ♀, Overhills, 27 August 1919, J. E. Ekert.

Georgia — 2 ♀, Waynesboro, 1 July 1940, H. O. Lund; ♀, Clark Co., 30 March 1949, T. A. Montgomery; 7 ♀, Jonesboro, 2 June 1951, P. W. Fattig.

Florida — ♀, McDavid, 1 July 1939; F. S. Blanton; 13 ♀, Hilliard, 28 July 1934 and 19 August 1930, R. H. Beamer, P. W. Oman, J. H. Nottingham, or L. D. Tuthill; ♀, Bruce, 15 Aug. 1949, ♀, Blountstown, 1948, and ♀, Santa Rosa Co., 16 August 1949, all D. J. Taylor.

Alabama — 2♀, Grand Bay, 11 July 1934, R. H. Beamer, Jr.; 5♀, Seminole, 14 June 1951, Beamers, Wood, Price.

Mississippi — ♀, Tishomingo Co., Iuka, 9 June 1933, T. H. Hubbell; ♀, Orange Grove, 10 July 1934, J. D. Beamer; 2♀, Delisle, 9 June 1944, Penn and Enlambremont.

Arkansas — ♀, DeQueen, 6 June 1951, Beamers, Wood, Prince.

In the collections of U. S. National Museum, Canadian National Collection, Museum of Comparative Zoology, American Museum of Natural History, Universities of Delaware, Kansas, Michigan, and Georgia, Tulane and Emory Universities, Pennsylvania and North Carolina Departments of Agriculture, L. L. Pechuman and the writer.

Variation. Considering the variation in the females, there is remarkably little in the six male paratypes, though all but one are from the same place. In two, the midfacial pollinose stripe is obsolescent, and in only one is there no evidence from any viewpoint of the midabdominal yellow streak. However, the latter is not prominent in any. The wing pattern also is very constant, except for a little variation in the extent of the hyaline triangles into cell R_3 above the furcation. The extent of the yellow on the hind femora is least extensive on the male with the most evident middorsal abdominal stripe.

There is sufficient variation in the presumed females to make one suspect it may still be composite, at least subspecifically as in the case of *C. obsoleta* and subsp. *lugens* (syn. *ultima* Whitney). In the majority, the hyaline triangle of the wings disappears just above the fork, but in a few, often taken in the same series, it may continue as a narrow lunule even reaching vein R_{2+3} as seen in most *C. obsoleta* (this may prove to be a taxonomically distinct form). The color of the abdomen may vary from a deep brown to blackish with one or three rows of slate gray spots accentuated by yellow hairs. In a few that appear to belong here, there are abbreviated, sublateral yellow lines on tergites 2 or 3. The extent of the

basal infuscation on the mid and hind femora may vary moderately as may also that on the face. The scutellum may be entirely dark or narrowly to broadly reddish on the hind margin. These variations so far can not be grouped into consistent combinations.

As indicated by Brennan (1935) for *C. lugens,* the average size of this is larger than *C. parvula*, the hind legs are more yellowish, and the apical spot crosses more constantly into cell R_5. It is believed the as yet undiscovered males of *C. parvula* will possess hind legs that are almost or entirely black or fuscous. The thoraces of *C. obsoleta* males not only have distinct yellow stripes above the wing bases, but abbreviated ones anteromedially as well. They also have the anal and cubital areas of the wing more definitely smoky, accentuated along the hind margin of the second basal cell in contrast to the subhyaline fore part of this cell, which is quite different than in *C. dacne* males.

Specimens have been provided by Drs. Alan Stone, J. C. Bequaert, R. H. Beamer, J. C. Champlain, H. O. Lund, P. W. Fattig, D. J. Taylor, G. H. Penn, D. L. Wray, E. S. Thomas, and L. L. Pechuman among others. The writer is especially indebted to Drs. Pechuman and Tuxen for helpful descriptions and opinions in the difficult elucidation of this complex.

Chrysops dampfi, n. sp.

(fig. 5a)

A pallid Mexican species resembling faded *C. flavida* in the yellowish appendages and callosity, and in wing pattern, but the abdomen with reduced brown geminations and spots.

Holotype, ♀, 9 mm. Front gray pollinose, taller than broad, parallel sided; ocellar tubercle neither darker nor bare. Callosity yellow, subovoid. Face and cheeks bare, yellowish, the tubercles a little more prominent than usual, the lateral pollinose stripes creamy, not reaching the oral margins. Antennae slender, reddish, darker on the annuli, the scape not thickened. Palpi yellow.

Thorax dull grayish pollinose with indistinct darker stripes on the notum, and a narrow dark brown stripe in front of each wing base. Scutellum and halteres yellowish. Legs yellow, darker at the joints and on the tarsi. Wing infuscated in the costal cell, about the basal half of the first basal cell, the crossband which is a little wider than the discal cell outwardly but leaves a small hyaline area in the base of the cell, reaches the posterior margin in cell M_3 but does not invade cell Cu_1, and merges with the apical spot in cell R_1 which then widens moderately across vein R_4 at about the middle, but invades cell R_4 only in the upper corner at the apex of the wing. Vein Cu_2 is narrowly margined with fumosity. There is a distinct

subhyaline area in the upper part of the crossband at the base of cell R_3, and the outer margin of the latter is nearly straight. The apex of the hyaline triangle reaches but does not cross vein R_{2+3}.

Abdomen pale yellowish, a small dusky spot beneath the scutellum on tergite 1, tergite 2 with a median, rather slender inverted brown "V" with wide-spread arms and truncated apex not quite reaching the anterior margin, tergite 3 with four rather small brown spots anteriorly, each pair of laterals barely joined above by a thin brown streak, tergite 4 with four isolated spots anteriorly, tergite 5 with suggestions of these, and tergites 6 and 7 dull brownish. Venter dull yellow with dull blackish median spots increasing in size caudad from sternite 2 to completely envelope sternites 5 to 7.

Farm in State of Sonora, Mexico. 8-VI-27. Dampf N.º 1288.

Allotype, ♂, 7.5 mm. Like the female except for the usual sex differences, and readily associated. The lateral facial tubercles and the abdominal pattern are a little more pronounced. The inverted "V" has lateral extensions along the incisure of tergite 2, and the paired maculations on tergites 3 to 4 are geminate; tergite 6 is entirely dark except for a narrow yellow hind margin. The wing picture is the same except that the apical spot fills cell R_1 and encroaches into about half of cell R_4.

Data same as the holotype but N.º 1284.

Paratypes, ♂ and 6 ♀ same data; ♀ "Nainani, Block 79, 13-VIII-27". In the collections of Inst. Salub. y Enferm. Tropicales, Mexico, D. F., L. L. Pechuman and the writer. There is some variation in the abdominal pattern approaching that in the allotype. The eye pattern of four relaxed specimens differs from that of *C. flavida* in that the occipital border is not separated from the eye margin behind; the arrowhead is connected above and sometimes below; the other spots are isolated from the anterior margin and from each other. Other differences from *C. flavida* are the less robust scapes, the almost imperceptibly lined thoraces, the taller and thinner inverted "V's" and geminate or divided spots of the abdominal pattern, and dark knees of the legs. This may be a form which has been confused with *C. flavida* in records of the Mexican fauna.

That *C. flavida* does occur in Mexico, however, is attested by a specimen I have from Coscapa, Vera Cruz, 25 April 1940, A. Martínez P., collector, which is darker than usual, particularly in the abdominal pattern. It resembles in this respect certain dark specimens from Florida. The thoracic stripes are greenish gray as in subsp. *celata* Pech. The type of *C. pallida* Bell. (not Macq.) is the typical form of *C. flavida* with respect to wing and abdominal patterns.

Chrysops divisa Walker

(Fig. 3b)

The writer agrees with Daecke (1906) that more attention should be paid to eye patterns in *Chrysops* with some eventual systematic advantage as a potentiality.

A series of 32 females taken in early April, mostly from Cow House Island, Okefenokee Swamp, Georgia, by P. W. Fattig, has enabled a study of variation in the unique eye pattern of this species. The basic pattern is characteristic for the genus, but the distribution and intensity depart radically by reduction in some respects analogous to *C. hirsuticalla* Philip. The occipital border may be indica-

Fig. 3 — *a,* head of *Chrysops discalis* Williston ♀ with extensive pollinosity of front and face; *b,* right eye pattern (relaxed) of *Chrysops divisa* Walker showing reduction of all spots except for accentuation of the frontal spot.

ted by a narrow shadow which becomes discrete as a small spot below and partially separated from the margin. The arrowhead and median frontal spots are unusually large, not connected, no shaft above, and the frontal spot rests widely on the anterior eye margin. The upper and lower frontal spots may be evanescent (in one the upper is completely absent), or of increasing size, comma-shaped, the tail separated from the eye margin, and rarely just touching the corners of the median spot at the margin. The ground is bright green in these relaxed specimens. The especially large and contiguous median spot is particularly unique.

Chrysops furcata Walker

(fig. 7a)

The type from St. Martin's Falls (Hudson Bay Territory) in BMNH was studied by the writer and found to represent, as previously assigned, the lighter form most prevalent in the central and western areas. Though the "obconical" spots on tergites 3 and 4

are a little heavier than usual, the fore coxae are completely yellow, which provides one of the better characters for differentiation from the variable, western *C. proclivis* complex.

Four robust, western males of *C. furcata* seen from different localities have agreed in having fore coxae, the sides of tergites 1 and 2 broadly yellow, and the third to fifth tergites quadrivittate.

Melanistic tendencies are particularly apparent in northern and eastern Canadian specimens where not only the forelegs become darkened as in the type, but black spots, sometimes very prominent and connected with the median figure, appear on the sides of tergite 2 as in *C. proclivis* and *C. aestuans*. These approach subsp. *abaestuans* with broadened apical spots and again complicate keying. This form has been noted by several workers, but variation and intergradation independently in all characters in occasional females often taken in the same series has prevented others and the writer from naming this melanistic variant. There is no satisfactory cleavage though there is roughly, in spite of exceptions, a geographic difference in predominant occurrence. In series, the yellower, western form is more robust, but as in individual tinctorial characters there are some exceptions.

A pair with duplicate data of the melanistic variant from Quebec from Gustave Chagnon has convinced the writer that this deserves a name in spite of the admitted impossibility of deciding where occasional females should be placed. The abdominal pattern of the male shows double gemination on all tergites. If this sex were available in equivalent numbers to the females, complete intergradation might again be evident. It is expected that some systematists will not concur in the following proposed name, though disagreement would perhaps have been less tenable had the male been established as holotype.

Chrysops furcata chagnoni, subsp. nov.

(Figs. 6c, 7c)

This is a dark form taken predominantly from the Hudson Bay region in Manitoba east to Labrador and Nova Scotia which approaches the *proclivissurda* complex of the West. The writer (1935) and Pechuman (1949) have both discussed this variant but the subsequent discovery of the male provided convincing evidence of their divergence.

Holotype, ♀, 9 mm. Differs from the usual *C. furcata* in the following characters: The antennae are blackish except for brown shadows inwardly on the scapes, the fore coxae are blackish with fuscous shadows inwardly, the fore and hind femora entirely and the midfemora on the basal half are black, all tibiae are darker

distally, there are two isolated, sublateral, upright black dashes on tergite 2, the median geminate spot connects to the black spot under the scutellum on tergite 1 with less constriction at the incisure.

La Pocatiere, Quebec, 24-IX-1940, Georges Gauthier, through courtesy of Gustave Chagnon fro whom the subspecies is cordially named.

Allotype, ♂, 9 mm. Like the ♀ in most respects except for the usual sex differences, the basal infuscation in the two basal cells much more extensive, and the maculations on tergites 1 and 2 much heavier with bigemination on both.

Same data as the holotype.

Paratype ♀'s: 1, Heart's Content, Nfld., 20 July 1949, W. J. Brown; 1, Baddeck, Cape Breton, Nova Scotia, 21 August 1938; 2 Tabusintac, N. B., 24-VII-1939, J. McDunnough; 1, Trois Pistoles, Que., July; 4, Natashquan, Que., 7-9-VIII 1929, W. J. Brown; 3, Cartwright and N. W. River, Labrador, 15 Aug. 1929, July 1933, and 4 Aug. 1938, F. C. Sears; 3, Macdiarmid Lake Nipigon, Ont., 30 VI and 3 VII 1923; 1, Churchill, Man., 2 July 1937, G. S. Brooks; 4, same place, 6 and 12 July 1948, L. A. Miller and B. Hocking; 4, Banff, Alta., 9-15 July 1938, and 17 July 1922, Eric Hearle; 1, Circle, Alaska, 23 July 1950. In the Canadian National Collection, Universities of Kansas, Montreal, and Alaska, U. S. National Museum, L. L. Pechuman, and the writer. The paratypes show some variation in infuscation of the legs, in constriction of the median figure on tergites 1 and 2, in size of lateral black spots on the latter, and in breadth of yellow hind-tergal margins but these are less often expanded sublaterally so as to give the quadristriate appearance of most *C. furcata*. Series are still too short to ascertain the amount of intergradation, but this complex would seem somewhat analogous to the *surda-proclivis* group in the West. The latter differ in the usually narrower apical spots of the wings, the crossbands reaching the hind margins, and the infuscation in the first basal cells in the females reaching the apex of the cells; infrequently in subsp. *chagnoni* there is a faint, median spur crossing the subapical hyaline spot in this cell.

Only five of the darker variants of *C. furcata,* where the typical form is common in the West, have shown suggestions, more reduced, of the sublateral black spots on tergite 2, and the occurrence of darkened fore coxae is infrequent. Conversely, occasional eastern specimens are seen in which the face is entirely yellow between the lateral pollinose stripes, the legs are almost entirely yellow except at the joints, and the maculations are reduced on the venter or even missing on sternite 2; such a specimen was forwarded by Dr. G. E. Shewell with data duplicating the Heart's Content, Nfld., paratype data. He and Pechuman have also forwarded specimens from the

Hudson Bay and other areas showing intergradation with the typical form in every character, which makes it more difficult to separate the females in the keys than the males. However, if the cleavage was clearcut this form would undoubtedtly be separated on the specific level.

Chrysops laeta Fabricius

Reports of occurrence of this South American species by Kröber (1925) and others in Costa Rica have remained in question because unverified. Recently, however, Fairchild (1953) has reported one taken in Almirante, Bocas Province, Panama, indicating its occurrence in Central America. The species, as discussed by Kröber, is somewhat variable.

Two specimens in the Dampf Collection from Mexico, "La Lucha, Campeche, 11-I-39" can be assigned to *C. laeta* subsp. *tenuistria* Kröber in spite of the distance from the type locality in Dutch Guiana. The wing picture agrees in having the narrowed crossband just including both ends of the discal cell and the small extension along vein R_{4+5}, but the apical spot and infuscation in the base and hind margin of cell Cu_1 are heavier than he figures. He also figures the abdomen without prominent triangles on tergites 3 to 5, but describes the abdomen as like the typical form which is figured with the median spot on tergite 3 reaching the anterior margin to divide the black. The two Mexican specimens have low median triangles on these tergites which merge with the yellow incisural bands. The legs are not "shining black", but predominantly brownish red, darker on the bases of the femora. The scutellums are margined with yellow, and the callosities are nearly black in one, but brownish on the disc in the other.

The irregularity of the outer margin of the crossband suggests that this may be distinct on a specific level if additional material from different localities is constant in this character. A specimen from Guatemala was compared and found in close agreement with the type in Turin Museum, as well as with the type of *C. neglectus* Williston in BMNH. The latter name has heretofore (Kröber, 1934, and others) been wrongly synonymized with *C. incisa* Macquart.

Chrysops latifrons Brennan

The original series of three females and one male is all that has been known heretofore. A considerable series of both sexes taken in the type locality by the writer and Dr. R. N. Philip, provides a better analysis of variation. A few have also been studied from Saratoga Springs, Inyo Co., Calif., through courtesy of Dr. J. N. Belkin. The describer's original indication of its close relation to

C. pachycera is further borne out, and it is evident that this is a very recent evolutionary divergence from the *pachycera* stem through geographic isolation. Three females and a male do not even show the "tooth" on the crossband reaching the fork of R_{4+5} but the outer margin of the crossband is still irregular compared to *C. pachycera.* In one of these, the wing picture has been so diluted that the outer veins and crossveins are only margined with brown. In certain specimens, the apical spot is only represented by an intensification of the brown margins of vein R_{2+3}. In certain specimens of both sexes the hyaline spot in cell Cu_1 does not encroach into cell M_3. In the males, the infuscation in both basal cells and on the abdominal patterns is more extensive, though the lateral spots on tergite 2 are variable.

In all of the females, the abdominal pattern is more shadowy, less contrasting on a more grayish than yellowish ground, the geminate figure on tergite 2 is joined to, not separated from, the spot on tergite 1 under the scutellum, and the pedicel is more swollen on the basal three-fourths than in typical *C. pachycera,* with a more distinct constriction at the distal fourth. On these bases, the writer would consider this still to be specifically distinct, though a young species of recent derivation.

On the other hand, the extent of variation seen in typical *C. pachycera* now convinces me that *C. dilata* Rowe and Knowlton is not tenable even as a variety or subspecies, and it is herewith synonymized completely. *C. hungerfordi* Brennan represents a melanistic variant which is separable as a subspecies. A number of *C. pachycera* have been seen in which the discal cell has a central paler but variable spot, which was one character used to separate *C. latifrons,* and which further weakens attempted application of Kröber's subenus *Heterochrysops* to the Nearctic tabanid fauna. Most *pachycera* fail to show the sublateral dark spots anteriorly on the notum, which are seen on most *latifrons.* The latter is probably a breeder in brackish environments as is *C. discalis* but exceptionally restricted in distribution. The females readily attacked the collectors.

Chrysops mexicana Kröber

Though Kröber (1925) originally described this as a subspecies of *C. calogaster* Schiner, Fairchild (1942b) has stated reasons for considering it specifically distinct. He also discusses variations observed in Panama specimens. The writer has studied the type female plus a male and two female "cotypes" from Vulcan, Colima, Mexico, in Munich Museum. The type has the extension from the crossband barely connecting with the cloud on the fork, and in one wing only of each of the other 2 females. None has yellow incisures

but in one there is a small yellow triangle on tergite 3 about half the size of that on 2. A third "cotype" female and male are *C. pachycnemia* Hine, and agree with the type of *C. engeli* Krb. in the same collection from the same locality.

Chrysops montana Osten Sacken

The apparent variability in females of this species has been commented on by a number of students of Nearctic *Chrysops,* most recently by Pechuman (1949). No adequate basis for cleavage, if any, yet has been found in that sex, though the degree of variability in characters makes one very skeptical that a comparable situation is not present to that found in *C. striata* from which *C. aberrans* was ultimately separated. Variation in characters of a few males from widely scattered areas in the East makes it appear probable that *C. montana,* as now considered, is composite. A male each from North Carolina and Florida are so melanistic, especially in the wing picture, compared to more northern specimens, particularly two reared by me in Minnesota, as to suggest totally different species. They run to different major sections of the foregoing key to males. Since the females do not show as much disparity, and material from the Southeast is especially scarce, the writer is loath at present to separate this as more than a subspecies, though it appears not unlikely that later biological as well as morphological information may show at least two specifically distinct forms in this complex so widely apart do the males from Minnesota and the South Atlantic Coast States appear.

Considering the more limited variation in comparable characters in most other Nearctic species and in spite of the usually scarce representation of this "species" in collections, it is difficult to believe that females are all one species. Infuscation in the first basal cell varies from one- to three-fourths or more including spurs that even cross the reduced apical hyaline areas. Apical spots vary from a relatively narrow condition comparable to that in *C. sackeni* to almost crossing cell R_4 with the apex of the hyaline triangle often reaching or, exceptionally, crossing vein R_{2+3}. The obdominal pattern above and below is also variable though quadrivittate, while occasional specimens have brown to yellow frontal callosities. The females almost never have the inner, lateral facial spots seen in the males, though the pits are often darkened. The femora also show unusual variation in color, particularly the hind femora which may be almost entirely yellow to almost entirely blackish from the same State. No geographic or other bases have been found to separate these variations which appear to occur independently in females that are often taken together. It is not certain whether any available

female can be associated with the males described below but the few females seen from Georgia and Florida do not show the same divergence.

Chrysops montana perplexa, subsp. nov.
(Fig. 7d)

Holotype, ♂, 7.5 mm. Face yellow, each tubercle with a dark brown spot inside the sutures; a short, yellow pollinose, pointed spur beneath the antennae, and lateral pollinose stripes reaching just beyond the pits, but not reaching the oral margin. The usual thoracic dorsal stripes plumbeus, scutellum and halteres blackish. Fore coxae and the mid and hind pairs blackish. Fore and hind femora, and base of mid pair dark brown; fore and hind tibiae, and tarsi distally dark brown, remainder of legs yellowish. Wings dark brown, a narrow subhyaline streak reaching from the outer lower corner of the first basal cell diagonally across the upper corner of the second basal cell and barely into the base of cell Cu_1. Hyaline triangle represented only by a narrow, broken subhyaline streak along the outer margin of the crossband disappearing before the hind margin of the wing and enclosed by expansion of the apical spot around the entire apex of the wing. The anal area smoky, darker in the anal cell. Abdomen yellow with double geminate figures on tergites 1 to 4, the median row heaviest, no median yellow triangle on 1 but small on 2 and 3 and barely perceptible as a notch on 4; the sublateral lines on 2 and 3 conected by shadows across anterior margins of the tergites. Remainder of the tergites black; hind margins of all narrowly yellow. Venter with a median dark band expanding caudally to envelop the entire fifth and following sternites. Narrow sublateral stripes present, attenuated anteriorly and fading on sternite 2.

Southern Pines, N. Car., 7 June 1920, Wm. T. Davis.

A paratype ♂, Orange Co., Fla., 7 July 1929, "Fla. Fruit Fly Trap Surv", in USNM shows an even darker abdominal pattern and legs, the hind tibiae blackish except at the extreme base.

In contrast, two males reared in July from larvae taken at Gull Lake, Crow Wing Co., Minn., 19 June 1924, are much lighter in coloration like the females. The hyaline triangle is open on the hind margin from the middle of cell R_4; one-fourth and one-third of the basal cells are hyaline at the apex; the anal area including the anal cell except at the tip is also hyaline. Tergites 3 and 4 each have four separated spots, and the sides of 1 and 2 are entirely yellow except for two small spots on the posterolateral margins of the latter. The legs are predominantly yellow. Reared females from the same collection are within the variation discussed previously. It is

improbable that the above described southern males should be associated with some other species.

Chrysops nigra taylori, subsp. nov.
(Figs. 4, 6a)

This is readily associated with typical *nigra* by the characteristic wing pattern. The latter, all the appendages and the entire body, including the face, however, are much more melanistic.

Holotype ♀, 7 mm. Compared to typical *nigra,* this differs as follows: face predominantly shining piceous, with only narrow, brownish shadows on the disc and the lateral yellow pollinose bands complete to the oral margin but narrower; antennae and palpi black, with only indefinite, reduced, reddish shadows basolaterally on the scapes; thorax and abdomen more subshiny black and more sparsely hirsute, hairs on abdomen mostly black, with pale ones intermixed from segment 5 on, both above and below; legs deep black with only the basal mid- and hind-tarsal segments yellowish; wings with apex hyaline, but the areas below and behind the pattern tinted, especially across cell Cu_1, and apex of the anal cell.

Fig. 4 — Head of *Chrysops nigra taylori,* subsp. nov. ♀ showing front taller than wide, and narrowed, bare, reddish-yellow midfacial line.

Quincy, Gadsden Co., Fla., 28 Apr. 1949, D. J. Taylor, "T.M. 288 4W-2N-28, caught in car." In the author's collection through courtesy of the collector.

It is surprising that this is the first record for *nigra* in the well-collected State of Florida. Other Gulf Coast records for the species also have been in April and early May but they no not show this melanism. More northern specimens with occasional melanistic tendencies, especially on the face, show the more characteristic

brown rather than blackish wing picture, and cell Cu_1 is not as heavily tinted.

CHRYSOPS SEQUAX COMPLEX

Material is deficient particularly in males to decide the validity or subspecific status of members of this obviously phylogenetically-young complex. *C. beameri* Brennan and *C. hinei* Daecke are certainly closely related and the morphological differences cited by Brennan (1935) have proved inadequate to separate all accumulating material. The color of the frontal callosity certainly, and the extent of the apical spot probably vary sufficiently to confuse current dichotomic analysis, especially in the absence of reliable males of *C. hinei*.

At present it is suspected that *C. sequax* is the oldest name for a number of variants of which *C. hinei* and *C. beameri* may be components but material and especially biological data are still inadequate for qualifying the present systematic, specific assignments of these names.

The following variant from Illinois, Ohio, and Arkansas appears distinctive enough to need description.

Chrysops sequax tau, n. subsp.

A yellow-bodied fly with lined thorax and abdomen resembling the *sequax* or *stricta* groups but unique in this section of *Chrysops* in having a midfacial, yellow pollinose figure the shape of the Greek letter tau, resembling that seen in *C. upsilon* Philip, abbreviated but hardly attenuated below.

Holotype, ♀, 7.5 mm. Eye pattern somewhat indefinite on relaxing but apparently all spots disconnected from one another and from the borders including the occipital one, as in Daecke's (1906) fig. 51 for *C. sequax* except that the point of the arrowhead is separated below. Front yellow pollinose, taller than wide, a much reduced dark bare area at the vertex around the ocelli, and a subovoid yellowish-brown callosity more compressed dorsoventrally than usual with darkened outer and upper margins; no bare midstreak connecting the latter to anterior ocellus, the pollinose interval deeper than in related species. Face yellow, brown outside the sutures, the bare areas restricted by two complete, wide, lateral pollinose stripes and an upper, median, golden pollinose stripe extending two-thirds the distance toward the oral margin, clavate below and connected above to a laterally pointed crossarm under each antenna. Cheeks yellow, dark brownish above and behind. Antennae slender, the scapes yellow, brown to blackish on the flagellums.

Thorax with a median plumbeus band and three lateral yellow stripes, the upper above the wing bases connecting with a broad

yellowish margin around the scutellum which encloses a small greenish triangle on the base. Fore coxae yellow, the two hind pairs blackish. Fore femora and basal half of fore tibiae yellow, remainder fuscous. Midlegs missing. Hind femora blackish, yellow on the apical fifth; hind tibiae yellow, darker on the distal half. Wing picture sharp, filling the entire first basal cell, the crossband reaching the hind margin in cell M_3 but not invading Cu_1, the outer margin gently bowed, the apical spot drop-shaped, filling about two-thirds of cell R_4, the apex of the hyaline triangle narrow, crossing cell R_3 to vein R_{2+3}, the second basal cell and anal area entirely hyaline.

Abdomen yellow, quadristriate on tergites 2 to 4, no gemination, the outer stripe narrowest on 2; tergite 1 with two small isolated spots under the scutellum, and tergites 5 to 7 entirely blackish except for narrow yellow incisures. Venter yellow with a broad median black band, and narrow lateral ones from sternite 3 caudad.

Golconda, Ill. 25 July 1930, Knight and Ross. In the Illinois Natural History Museum.

Paratype, ♀'s — 4, Harrisburg, Ohio, 24 July 1930, J. S. Hine; 1, Franklin Co., Ohio, 7-17-42; 1, Red Hills, Franklin Co., Ohio, VII-1-33, J. Hamilton-J. Thomas; and 3 ♀, Delaware Co., Ohio, 3, 11, and 23 Aug. 1942, R. L. Blickle, D. J. & J. N. Knull, collectors; ♀, Wash. Co., Ark., 21-VII-31. In the collections of the U. S. National Museum, L. L. Pechuman and the author. In two, the black of the cheeks and hind femora are more extensive, the scutellum has only abbreviated lateral yellow shadows, and the sublateral lines are more prominent on tergite 2. The callosity is brownish to black in three and a little deeper. The ocellar callus is reduced in all and less shining than in typical *C. sequax* or *C. beameri*. Two paratypes have short spurs on the forks, and the black on tergite 5 is notched by yellow behind.

The midfacial pollinosity is distinctive from any Nearctic species which this resembles, though five specimens of *C. sequax* from Illinois and one from Ohio had small, indefinite, midfacial dustings which impelled retaining these as a subspecies at least until more material including males is available. The midfacial pollinosity in subspecies *tau* with the two upper arms attenuated along the lateral sutures is as well developed as most of the *mitis-excitans* groups and might justify an opinion that these are distinct on a specific level. In typical *C. sequax*, the abdominal lines are usually more complete and the apical spot of the wing picture is more extensive. In *C. beameri*, which the wing picture and yellow callosity of this more closely resemble, the sublateral lines on both the dorsum and venter of the abdomen are usually more evident on segment 2, the thoracic stripes are brighter, and the hind legs have

more yellow in the specimens seen. In both these species, the bare area about the ocelli is expansive and subquadrate.

Excluding the unusual facial pollinosity for this group, subspecies *tau* seems intermediate in many respects between *C. sequax* and *C. beameri*. Thirty-two other females of *C. sequax* from various localities in the U. S. National Museum show no trace of pollinosity on the fronto-clypeus according to Dr. Stone.

Chrysops leucospila Wiedemann

This species was described from Brazil, but there has since been some confusion as to its identity, in spite of the distinctiveness of the wing characters. It has been included in the key to North American fauna on the strength of Kröber's (1943) inclusion of Costa Rica in its distribution, though Fairchild (1942b) states this record should probably refer to *C. melaena* Hine. The original description of the latter clearly differentiates these 2 species, as did comparison with type in Vienna Natural History Museum.

Chrysops pachycnemia Hine

The type of *C. engeli* Kröber from Vulcan, Colima, Mexico, was seen in the Munich Museum by the writer. The types in the same collection of Kröber's *C. calogaster* var. *mexicanus* are from the same locality, including a male and female of the cotype series which agree with *C. engeli*. The male description is thus wrongly applied to *mexicanus*. Comparison of these specimens with a female of *C. pachycnemia* Hine from Mexico leaves no doubt that *C. engeli* is a synonym. The two species were keyed separately owing to Kröber's wrong figuring of the hyaline spot as in cell M_3 instead of the usual Cu_1, and the more reduced black in the abdominal pattern than in any specimens previously studied of *C. pachycnemia*. It is remarkable that Kröber overlooked the swollen tibiae, since he mentions the less pronounced swelling of the tibiae in describing *mexicanus*.

Chrysops calogaster Schiner

The similarity of this to *C. mexicana* Kröber and *C. soror* Kröber is discussed by Fairchild (1942b). All of these have rather large reddish callosities with dark upper margins and conspicuous grayish to deep yellow, pollinose spots in front of the bases of the wings on the pleura. Kröber's types of *C. mexicana* are from Colima, Mexico, and Fairchild discusses specimens from Panama that agree closely with the description except for minor variations. A specimen from Santander, Colombia, determined by Bequaert, is also in agreement, but the tibiae, particularly the fore pair, are noticeably

more slender than other specimens in this group, whereas Kröber describes the types as somewhat enlarged in this respect. Its occurrence between Colima and Panama should be checked to confirm the southern records as *C. mexicana.* The apical spot in this group and outer margin of the crossband seem to be somewhat variable.

Two specimens in the Dampf Collection from Chiapas appear to represent an undescribed species in this group intermediate between *C. soror* with dark thorax and *C. calogaster* with ornamented abdomen. They can hardly be variants of *C. mexicana,* though Fairchild entertained this possibility after seeing one of them.

Chrysops fairchildi, n. sp.

A small, rather dark species of the *C. calogaster* group with black callosity, cheeks and thorax, yellow patterned abdomen, somewhat swollen, dark tibiae, and broad apical spots.

Holotype, ♀, 6 mm. Eyes (relaxed) with indistinct pattern suggesting a narrow contiguous, occipital margin, the upper and lower frontal spots barely contiguous to the ocular margin, the shaft isolated above but arrowhead connected to a rather large median spot and the point separated below from the margin. Front subequal in height and breadth, gray pollinose, a wide quadrangular, shiny black callus at the vertex and a narrow, black callosity nearly its full width. Face narrowly yellow in the middle and a patch of gray pollen in the upper third, black laterally and on the cheeks, the lateral yellowish gray pollinose stripes complete to the oral margin. Antennae slender, reddish, the annuli dark. Palpi reddish.

Thorax subshiny, black with a sparse gray bloom and short, sparse yellow hairs. No paler lines or spots evident on the notum or pleura. Coxae, bases of the femora, and fore and hind tibiae dark; legs otherwise yellowish. All tibiae moderately swollen. Wings with about the basal third and fourth of the respective basal cells infuscated, the crossband broad, the outer margin bowed and reaching the hind margin between the M_3 and anal veins, a triangular hyaline spot in the outer half of cell Cu_1, the hyaline triangle narrow, crescentic and enveloping a small but distinct cloud on the fork as a narrow halo on the distal side, widening on the hind margin of cells M_1 and M_2, apical spot not as dense as crossband but widened along hind margin into cell R_5. Halteres dark.

Abdomen with tergite 1 entirely black except for very narrow lateral margins; 2 with a very heavy dark arch or half moon leaving the antero-lateral margins, and a low equilateral triangle on the hind margin yellow; 3 with a flat yellow triangle on the hind margin, extended laterally nearly to the sides; 4 with a prominent and 5 with

a narrow, yellow hind margin. Venter with the first two sternites predominantly reddish, the remainder black. Short, sparse appressed yellow hairs over all.

Palenque, Viajo, Chiapas, 1-3-31, N.° 118.

Paratype, ♀, Pescadero, Pueblo Nuevo, Chiapas, XI-20-30. In close agreement, except antennae missing and apical spot less extensive with only a spur in cell R_5 so that the small, isolated cloud on the fork is more prominent. Cell R_4 is completely filled outwardly.

The entirely dark thorax, abdomen with yellow pattern, and black frontal and facial callosities are distinctive from other species in the group. The callosity is shallower in proportion to width, and the abbreviated pollinose patches under the antennae of both specimens are unusual for the group.

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ERRATA ET ADDENDA
(Part VIII)

P. 14, at end of Abstract add: "*Esenbeckia curtipalpis,* n. sp. (holotype ♀, from Mexico)".

P. 16, at end of Introduction add: "Types of new species herein described which are not otherwise indicated are in the collection of the author at the Rocky Mountain Laboratory, Hamilton, Montana."

P. 19, line 6. Change "Triple" to Tribe.

P. 19, line 11 from bottom. Change "Paratipes" to Paratypes and "Colma" to Colima.

P. 26, at end of footnote add: "Since the appearance of Part VIII and while Part IX was in press, the article by Mackerras has been published, Aust. Jour. Zool., Vol. 2, part 3, under the title THE CLASSIFICATION AND DISTRIBUTION OF TABANIDAE (DIPTERA). I. Based in part on logical deductions from genitalia studies, the old subfamily Pangoniinae as it concerns the present Parts VIII and IX, are reassigned as follows: Pangoniinae, Tribe Pangoniini = *Pilimas, Stonemyia, Brennania, Apatolestes, Esenbeckia, Proboscoides,* and *Asaphomyia;* Tribe Scionini = *Goniops, Fidena, Scione,* and *Pityocera;* subfamily Chrysopinae (removed from preceding subfamily): Tribe Bouvieromyiini = *Mery-*

comyia; Tribe Chrysopini = *Silvius, Chrysops* and subgenera *Zeuximyia* and *Liochrysops,* and *Assipala."*

P. 30, line 7. Change "blak-haired" to black-haired.

P. 31, line 5. Change "and" to an.

P. 43, line 4 from bottom. Change "later" to latter.

P. 58, line 7 from bottom. Change "obdomen" to abdomen.

(Part IX)

P. 48, line 7. Change "♀ couplet 4" to ♂ couplet 4.

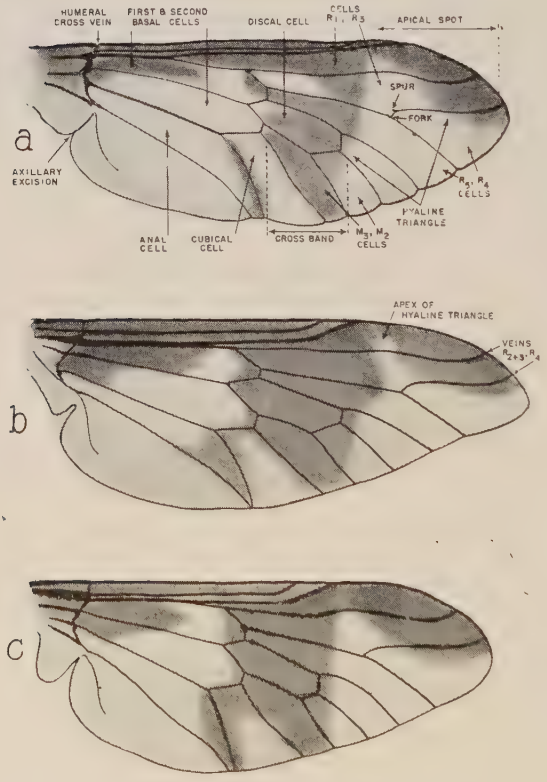

Fig. 5 — Wing patterns of *Chrysops*: a, *dampfi,* n. sp. ♀ ; b, *coquilletti* Hine ♀ ; c, *wileyae,* n. sp. ♀ .

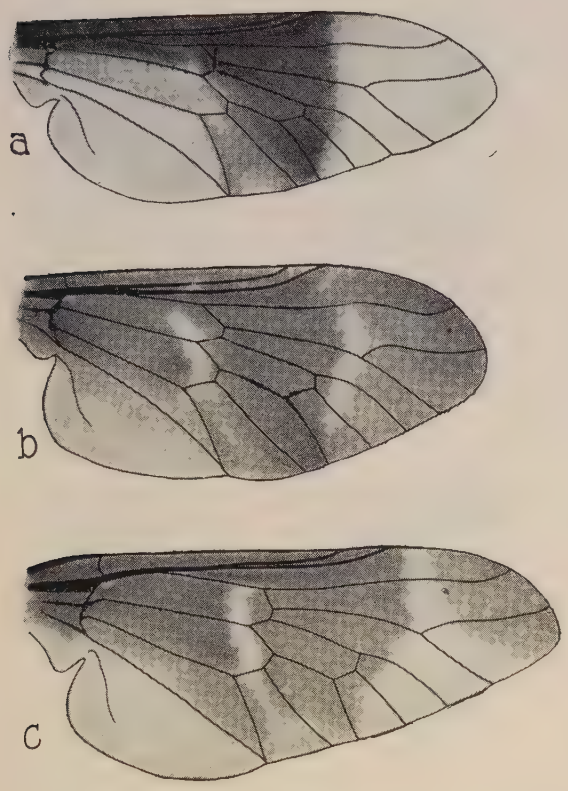

Fig. 6 — Wing patterns of *Chrysops*: a, *nigra taylori*, subsp. nov. ♀ ; b, *furcata chagnoni*, subsp. nov. ♀ ; c, *carbonaria nubiapex*, subsp. nov. ♂ .

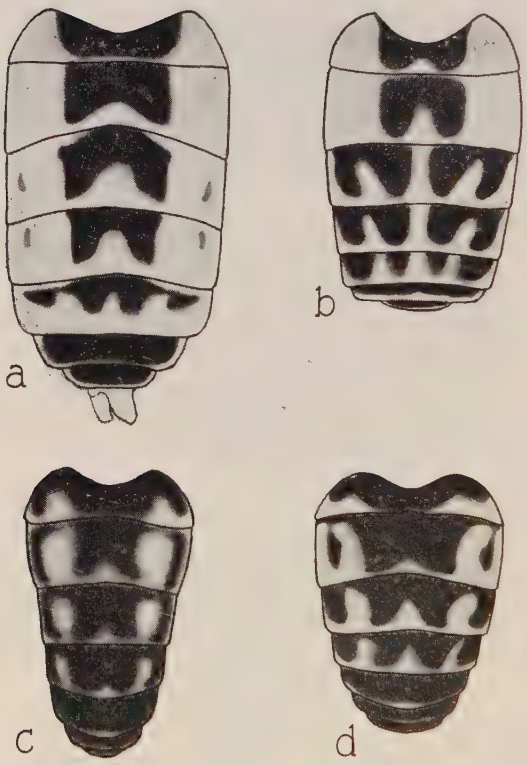

Fig. 7 — Abdominal patterns of *Chrysops*: a, *furcata* Walker ♂ ; b, *wileyae*, n. sp. ♀ ; c, *furcata chagnoni*, subsp. nov. ♀ ; d, *montana perplexa*, subsp. nov. ♂ .

abata Phil. (Chrysops) (3) : 52
abata, n. sp. (Esenbeckia) (2) : 29, 33, 36
abaestuans Phil. (3) : 69, 75, 83
abaureus Phil. (2) : 27
abdominalis, n. sp. (2) : 55
aberrans Phil. (3) : 63, 86
aestuans Wulp. (3) : 68, 80
affinis Bell. (Chrysops) (3) : 53, 77
affinis Phil. (Apatolestes) (2) : 21, 22
aitkeni Phil. (2) : 20, 22
albomacula Stone (2) : 27
albipilosus Bren. (2) : 21.
alleni Fchld. (3) : 49, 72
altivaga O. S. (3) : 54, 77
amazon Daecke (3) : 57, 76, 87
APATOLESTES Will. (2) : 17, 20
apicalis Bell. (3) : 77
ASAPHOMYIA Stone (2) : 18, 60
asbestos Phil. (3) : 59, 75
ASSIPALA Phil. (2) : 18, 58
ater Bren. (2) : 20, 22
atlantica Pech. (3) : 71, 79
atricornis Walk. (3) : 93
aurespygia Fchld. (2) : 23
auroguttata Krb. (3) : 68, 80, 88
aurulans Wied. (2) : 23
beameri Bren. (Chrysops) (3) : 63, 86
beameri Phil. (Pilimas) (2) : 26
balzaphire, n. sp. (3) : 54, 89
bicolor Krb. (2) : 24
bishoppi Bren. (3) : 60, 80
bistellata Hine (3) : 61
BRENNANIA Phil. (2) : 17, 19
brennani Phil. (3) : 53, 76, 94
brimleyi Hine (3) : 60, 81, 84
brunnea Hine (Chrysops) (3) : 61, 70, 79
brunnea Stone (Merycomyia) (2) : 60
californica Big. (2) : 26
callida O. S. (3) : 69, 80
calogaster Schin. (3) : 60, 115
caloptera Hine (3) : 49, 72
carbonaria Walk. (3) : 51, 73, 91
caustica O. S. (2) : 34, 38
celeris O. S. (3) : 51, 73, 93

(1) Genera in capitals; synonyms in italics; volumes of this Journal in parentheses.

celata Pech. (3) : 72
ceras Twns. (2) : 58
chagnoni, n. subsp. (3) : 66, 82, 106
chagresensis Fchld. (2) : 30, 31
chiriquensis Fchld. (3) : 52, 74
chrysocoma O. S. (2) : 16
CHRYSOPS Meig. (2) : 18; (3) : 47, 49
claripennis Ric. (2) : 23
clavicornis Bren. (3) : 53, 76, 94
colei Phil. (2) : 21, 22
coloradensis Big. (3) : 66, 82, 93
columbiensis Krb. (2) : 24, 25
comastes Will. (2) : 21, 22
coquilletti Hine (3) : 55, 78, 95
cuclux Whit. (3) : 50, 73
cursim Whit. (3) : 70, 83
curtipalpis, n. sp. (2) : 30, 38
dacne, n. sp. (3) : 64, 84, 99
dampfi, n. sp. (3) : 66, 82, 103
delicatula O. S. (3) : 68, 80
delta Hine (2) : 33, 36
dilata Rowe and Knowl. (3) : 54, 77
dimmocki Hine (3) : 71, 83
discalis Will. (3) : 52, 74
dissimilis Bren. (3) : 53, 77
divisa Walk. (3) : 51, 105
dorsopuncta Fchld. (3) : 51
dorsovittata Hine (3) : 57, 76
downsi, n. sp. (2) : 30, 41
engeli Krb. (3) : 69.
ESENBECKIA Rond. (2) : 17, 28
eiseni Twns. (2) : 18
excitans Walk. (3) : 51, 73
facialis Twns. (3) : 54, 78
fairchildi, n. sp. (3) : 60, 116
fera Will. (2) : 27
festa G.-Tos. (2) : 17
FIDENA Walk. (2) : 17, 24
filipalpis Will. (2) : 31, 35
fidenodes End. (2) : 52
flavida Wied. (3) : 71, 82, 86
flavohirta Bell. (2) : 30, 32, 34, 35
floridana Jhns. (3) : 62
frazeri Will. (3) : 67
frigida O. S. (3) : 59, 76

fuliginosa Wied. (3) : 60, 81, 84
fulvaster O. S. (3) : 53, 75
fulvistigma Hine (3) : 51, 74
fulvosericea Krb. (2) : 25
furcata Walk. (3) : 66, 82, 105
fusca, n. subsp. (2) : 19
fuscipennis Wied. (2) : 39
fuscipes End. (2) : 34, 43
geminata Wied. (3) : 70, 86
gertschi, n. sp. (2) : 33, 40
gigantea Krb. (3) : 77
gigantulus Lw. (2) : 54
globosa Walt. (2) : 18
GONIOPS Ald. (2) : 16
gracilis Krb. (2) : 25
haitiensis Stone (2) : 60
hera O. S. (2) : 17, 19
hinei Bren. (Apatolestes) (2) : 21, 22
hinei Daecke (Chrysops) (3) : 63, 86
hirsuticalla Phil. (3) : 50, 73
howardi Fchld. (2) : 24
hubbelli, n. subsp. (3) : 57, 88
hungerfordi Bren. (3) : 56, 78
hyalina Shan. (3) : 49, 87
illota Will. (2) : 32, 35, 46
imfurcata Phil. (3) : 64.
impuncta Krb. (3) : 70, 86
incerta Bell. (2) : 32, 35, 45
incisa Macq. (3) : 68, 93
inda O. S. (3) : 62, 83
incisuralis Say (2) : 30, 31, 35, 49
isabellina Wied. (2) : 26
isthmiae Fchld. (2) : 24, 25
laeta Fabr. (3) : 67, 80, 108
lateralis Wied. (3) : 70, 82
laterina Rond. (2) : 24
laticallus Bren. (2) : 55
latifrons Bren. (3) : 53, 77, 108
latifasciata Bell. (3) : 67
leucospila Wied. (3) : 67, 115
LIOCHRYSOPS, n. subgen. (3) : 49, 87
lugens Wied. (3) : 64, 85
luteopennis Phil. (3) : 61
maculipennis Schin. (2) : 23
megaceras Bell. (2) : 58

mejiai Fchld. (2) : 32, 35, 36
melaena Hine (3) : 68, 80
melanopa Hine (2) : 29, 33
melanoptera Hine (2) : 58
MERYCOMYIA Hine (2) : 19, 60
mexicana Krb. (Chrysops) (3) : 60, 83, 109
mexicana, n. sp. (Esenbeckia) (2) : 32, 45
micheneri, n. sp. (2) : 32, 36, 48
microcephalus Wehr. (2) : 54
minor Krb. (2) : 39
mitis O.S. (3) : 51, 73
mixta Hine (2) : 60
moecha O.S. (3) : 62, 84
montana O.S. (3) : 62, 65, 83, 85, 110
mutata Pech. (3) : 54
NEOCHRYSOPS Walt. (2) : 18
nigra Macq. (3) : 51, 73
nigribimbo Whit. (3) : 51, 74
nigripes Zett. (3) : 58, 75
nigroptera Fchld. (3) : 51
nigronotata Macq. (2) : 31, 35, 38
noctifera Will. (3) : 57, 76
notatus Big. (2) : 55
nubiapex, n. subsp. (3) : 76, 92
obsoleta Wied. (3) : 64, 84
osornoi Fchld. (2) : 32
pachycera Will. (3) : 54, 56, 77, 78
pachycnemia Hine (3) : 69, 115
pallidofemorata Krb. (3) : 68, 88
parkeri Phil. (2) : 21, 22
parvula Daecke (3) : 64
pavida Will. (2) : 29, 33
pechumanni Phil. (3) : 58, 76
perplexa, n. subsp. (3) : 85, 111
pertinax Will. (3) : 58, 76
philipi Pech. (2) : 54, 57
picea Phil. (3) : 65, 81
pigra O.S. (2) : 26
pikei Whit. (3) : 63, 86
PILIMAS Bren. (2) : 17, 26
PITYOCERA G.-Tos. (2) : 17
planiventris Macq. (2) : 30, 34, 42
pollinosus Will. (2) : 54
prasiniventris Macq. (2) : 32, 34
proclivis O.S. (3) : 64

pudica O.S. (3) : 70, 83
pyrausta O.S. (2) : 25
quadrivittatus Say (2) : 54, 55
rasa Lw. (2) : 27
reicherti Fchld. (3) : 72, 82
rhinophora Bell. (2) : 25
RICARDOA End. (2) : 28
robusta Bren. (3) : 56, 78
rossi Phil. (2) : 20, 22
rúficornis Big. (2) : 26
sackeni Hine (3) : 65, 80
sallei Bell. (2) : 35
saussurei Bell. (2) : 30, 34
sayi Bren. (2) : 54
scalarata Bell. (3) : 68, 77
schildi Hine (2) : 24
SCIONE Walker (2) : 17, 23
semiflava Wied. (2) : 28, 29, 33
seminuda Coq. (2) : 31, 35
separata Hine (3) : 57, 76
sequax Will. (3) : 56, 64, 86, 113
shermani Hine (3) : 61
SILVIUS Meig. (2) : 18, 53
similis Bren. (2) : 21, 22
sordida O.S. (3) : 50, 57, 75
soror Krb. (3) : 59
STONEMYIA Bren. (2) : 17, 26
striata O.S. (3) : 63, 86
subcaecutiens Bell. (3) : 55, 78
subfascipennis Macq. (3) : 66
surda O.S. (3) : 65, 80, 81
tanycerus O.S. (2) : 58
tau, n. subsp. (3) : 56, 113
tenuistria Krb. (3) 67
taylori, n. subsp. (3) : 51, 112
tepicana Twns. (2) : 29, 53
texanus Pech. (2) : 54
texensis Stone (2) : 19, 60
tinkhami, n. subsp. (2) : 30, 35, 50
tranquilla O.S. (2) : 27
translucens Macq. (2) : 31, 34
trapidoi Fchld. (2) : 24
triangularis, n. sp. (2) : 31, 44
ultima Whit. (3) : 64
univittata Macq. (3) : 62, 86

upsilon Phil. (3) : 57, 84
variegata DeGeer (3) : 66, 85
venus Phil. (3) : 59
vittata Wied. (3) : 62, 86
velutina Big. (2) : 27
villosulus Big. (2) : 22, 23
virgulata Bell. (3) : 55, 77
vulpes Wied. (2) : 28
whitneyi Jhns. (2) : 60
wiedemanni Bell. (Esenbeckia) (2) : 29, 33, 39
wiedemanni Krb. (Chrysops) (3) : 70, 81
wileyae, n. sp. (3) : 56, 78, 96
willistoni Bren. (2) : 21, 22
willistoni Hine (Chrysops) (3) : 69
xanthas Phil. (3) : 58, 76
yepocapa Fchld. (2) : 29, 33
zayasi Beq. (3) : 68
ZEUXIMYIA Phil. (2) : 18
zinzala Phil. (3) : 58
ZOPHINA, n. gen. (2) : 18.

Rev. Brasil. Ent. 3 : 129-135 - Junho, 1955 - S. Paulo

DUAS NOVAS ESPÉCIES DE HERMETIINAE DO BRASIL (DIPTERA, STRATIOMYIDAE) (1)

DALCY DE O. ALBUQUERQUE
Museu Nacional, Rio de Janeiro, D. F.

Hermetia gonçalvesi, sp. n.

MACHO — Côr geral negra. Comprimento total - 13 mm.

CABEÇA — Olhos pilosos. Espaço interocular largo anteriormente, estreitando-se para o vértice e medindo à altura do ocelo anterior, cerca de 3,4 da largura da cabeça. O espaço interocular é negro, apresentando ao lado do triângulo ocelar (ao nível do ocelo anterior) duas manchas claras arredondadas. Abaixo do triângulo ocelar medianamente, há no espaço interocular, uma bossa negra brilhante sem pêlos. O espaço interocular pouco acima da metade, apresenta uma faixa transversal clara, que se prolonga lateralmente junto à margem dos olhos até a extremidade das genas e medianamente até a extremidade de uma saliência, encontrada na face, que vista de perfil é adunca. O espaço interocular e a face são cobertos de pêlos prateados. Antenas com o 1.º, 2.º e a base do 3.º artículo, castanhas. Ultimo artículo antenal lanceolado.

TÓRAX — Negro, com úmero, protórax, parte superior da sutura da mesopleura, parte da pteropleura, da hipopleura, calo postalar e ápice do escutelo, branco amarelados.

PERNAS — Perna I com a articulação fêmuro-tibial e ápice da tíbia, castanhos. Tarsos brancos, amarelados. Unhas com a metade basal castanha e a apical negra. Empódios e pulvilos amarelos, acastanhados. Perna II idêntica à perna anterior. Perna III com o ápice dos fêmures e as metades basais das tíbias, branco-amarelados. No mais, idêntica aos outros pares de pernas. Balancim branco amarelado.

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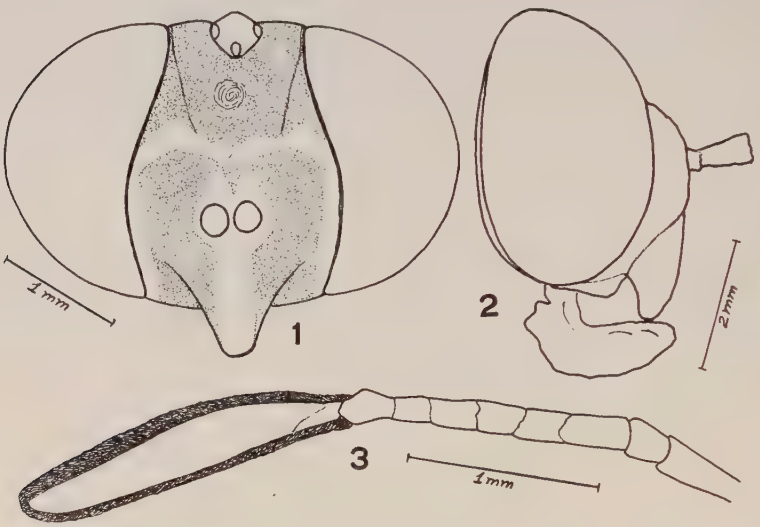
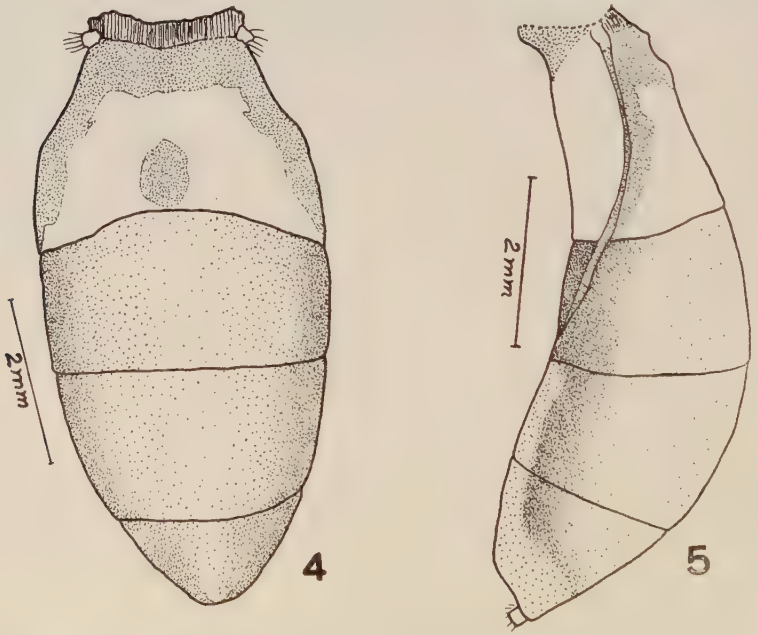
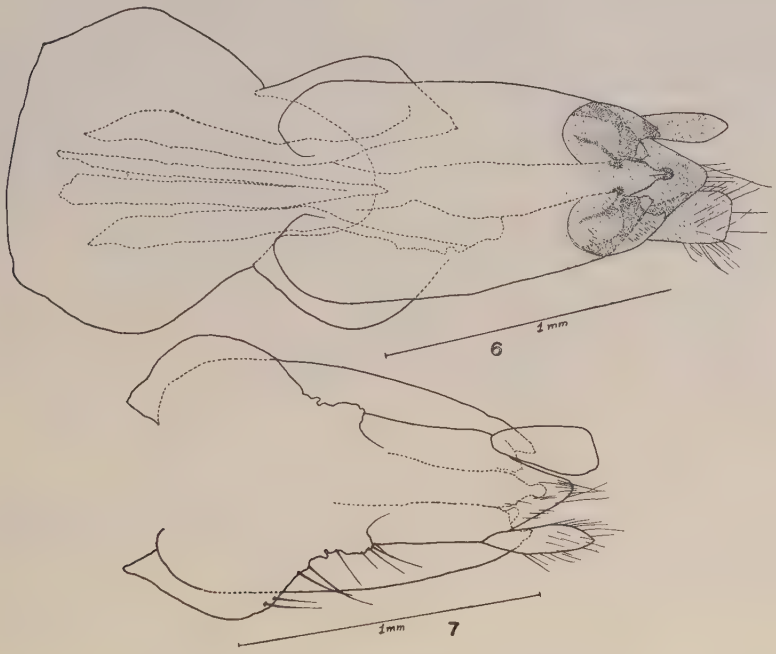
(1) Trabalho realizado sob os auspícios do Conselho Nacional de Pesquisas. Recebido para publicação a 2 de Dezembro de 1954.



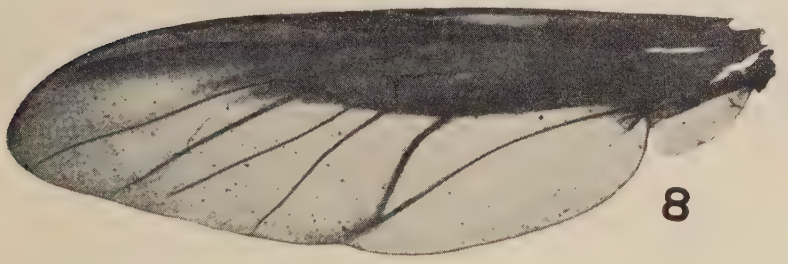
Hermetia gonçalvesi, sp. n.
Fig. 1 - Cabeça, de frente; Fig. 2 - Cabeça, de perfil; Fig. 3 - Antena.



Hermetia gonçalvesi, sp. n.
Fig. 4 - Abdômen, vista dorsal; Fig. 5 - Abdômen, de perfil.



Hermetia gonçalvesi, sp. n.
Fig. 6 - Genitália, vista dorsal; Fig. 7 - Genitália, vista ventral.



Hermetia gonçalvesi, sp. n.
Fig. 8 - Asa.

Asas — Com a metade inferior castanha e a superior hialina, sendo que as células costais, subcostais e as primeiras marginais, são amarelas. Nervação como na figura.

Abdômen — Peciolado, coberto de fina pilosidade prateada. Primeiro segmento, ventralmente translúcido, apresentando nas margens laterais uma orla branca opaca. Dorsalmente, o primeiro seg-

mento apresenta uma grande mancha trapezóide translúcida e uma mácula negra arredondada mediana. As margens laterais da mancha hialina é de um branco opaco. Os dois últimos segmentos abdominais têm ligeira tonalidade castanha, que são mais visíveis nas margens.

Material examinado — Holótipo macho n.° 4693, Salvador, Eng. Velho (Estado da Bahia) Brasil, 28-VIII-1951, D. Albuquerque col. Depositado na coleção do Museu Nacional.

Hermetia gonçalvesi, sp. n. é próxima de *H. ampulla* James, 1938, da qual se separa pela coloração do abdômen, que é inteiramente negro em *H. ampulla* James.

Dedicamos *H. gonçalvesi,* sp. n. ao nosso amigo Dr. Ayrton Gonçalves, que ensaiou conosco um estudo sôbre algumas espécies de *Hermetia* Latr. do Brasil.

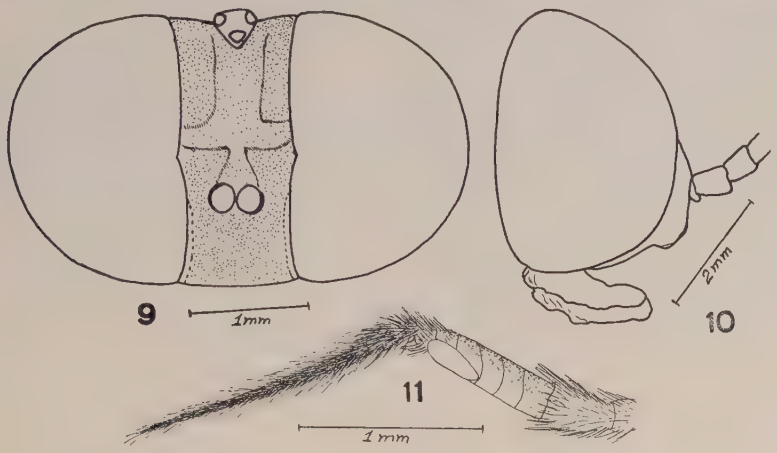
Parahermetia secunda, sp. n.

Macho — Côr geral castanha. Comprimento total - 15 mm.

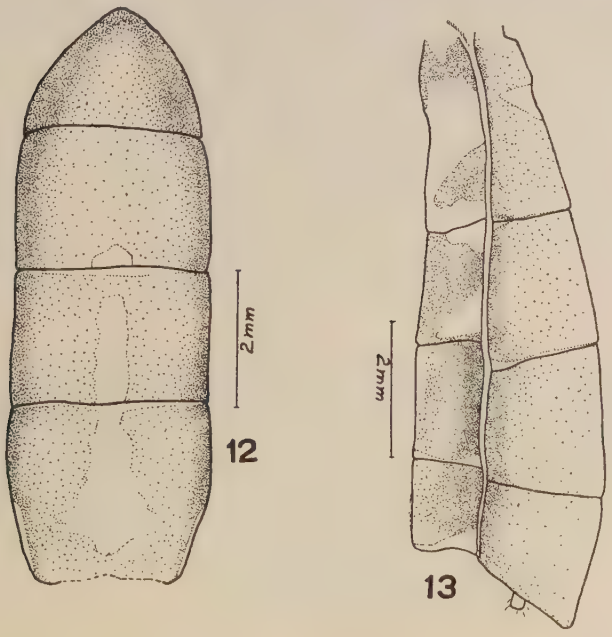
Cabeça — Olhos grandes (de perfil, ocupando quase toda a cabeça), com cílios curtos, esparsos e as facetas ântero-internas alargadas. Espaço interocular estreito, medindo cerca de 4 vêzes a largura da cabeça. Os bordos internos dos olhos apresentam medianamente uma chanfradura, como nos Empididae. O espaço interocular é piloso (salvo uma faixa transversal, pouco acima das antenas), castanho, com áreas mais ou menos claras disseminadas. Face com uma bossa, que vista de perfil é arredondada. Vértice deprimido, lembrando Asilidae. Cabeça posteriormente convexa, como em Tabanidae. Antenas longas, negras, com o segundo artículo ligeiramente castanho. Face interna do segundo artículo antenal no ápice, com uma área branca pontilhada. Terceiro artículo antenal plumoso. Prebóscida e palpos castanhos, com pêlos amarelos.

Tórax — Castanho escuro, com protórax, suturas pleurais e pleuras ligeiramente mais claras. O tórax é coberto de pilosidade clara. Dorsalmente, o tórax apresenta um par de faixas castanhas, que se fundem na sutura, para depois continuarem separadas até a base do escutelo. Ápice do escutelo castanho. Infra-escutelo castanho mais claro que o ápice do escutelo. Balancim amarelo alaranjado.

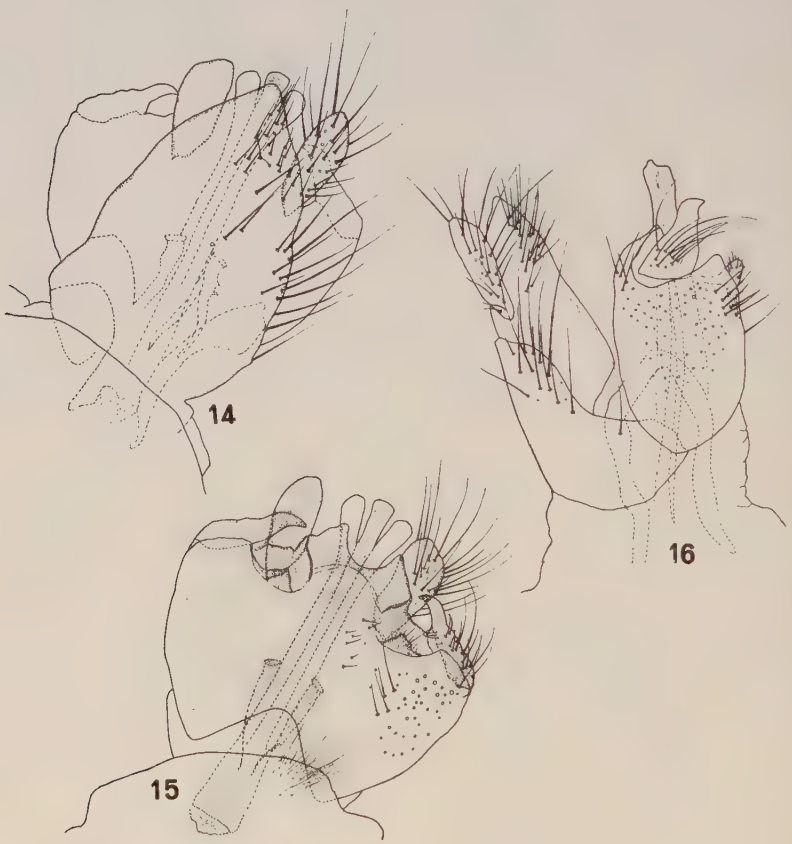
Pernas — Perna I com coxa, trocanter e fêmur, castanhos. Tíbia e tarsos amarelos, ligeiramente alaranjados. Unhas com a metade basal alaranjada e apical negra. Pulvilos e empódios da mesma côr da tíbia. Perna II idêntica à perna anterior. Perna III com a metade apical do fêmur ligeiramente mais clara; no mais, idêntica aos pares anteriores.



Parahermetia secunda, sp. n.
Fig. 9 - Cabeça, vista de frente; Fig. 10 - Cabeça, de perfil; Fig. 11 - Antena.



Parahermetia secunda, sp. n.
Fig. 12 - Abdômen, vista dorsal; Fig. 13 - Abdômen, de perfil.



Parahermetia secunda, sp. n.
Fig. 14 - Genitália, vista dorsal; Fig. 15 - Genitália, vista ventral; Fig. 16 - Genitália, de perfil.

Parahermetia secunda, sp. n.
Fig. 17 - Asa.

Asas com a margem inferior amarela e a superior enegrecida. Nervação como na figura.

Abdômen — Castanho, com pêlos alaranjados e apresentando medianamente na face dorsal, uma mancha hialina, que se inicia no primeiro segmento, indo até quase o ápice do terceiro. Os segmentos abdominais são castanhos claros nas articulações. Visto de perfil, a junção dos tergitos e esternitos são amarelos, alaranjados. Ventralmente o abdômen apresenta o primeiro e segundo segmentos amarelos, alaranjados (translúcidos), com uma mancha negra lateral. O terceiro segmento, apresenta os ângulos superiores externos amarelados. Os demais segmentos são castanho-amarelados nas articulações, como quando vistos de perfil. Ultimo segmento, visto de perfil, truncado, como na figura.

Material examinado — Holótipo macho, Campos do Jordão, Umuarama, (Estado de São Paulo), Brasil, Travassos & Oiticica Filho col., 29-I-1938. Depositado na coleção do Instituto Oswaldo Cruz, sob n.º 8411.

Parahermetia Lindner, 1928, difere de *Hermetia* Latr., 1804, principalmente pelo aspecto do 3.º artículo antenal. *Parahermetia* Lind., 1928, contem uma espécie, *P. seitzi* Lindner, 1928, que pode ser separada de *Parahermetia secunda,* sp. n., pela coloração geral negra.

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Rev. Brasil. Ent. 3: 137-167 - Junho, 1955 - São Paulo

REVISÃO DOS NOMES GENÉRICOS SUL-AMERICANOS DA SUBFAMÍLIA CASTNIINAE (LEPIDOPTERA CASTNIIDAE) (1)

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INTRODUÇÃO

1 — ORIGEM DO PRESENTE TRABALHO.

Interessado há muito pelos lepidópteros sul-americanos da subfamília Castniinae Dalla Torre, 1913, devido aos problemas interessantes de morfologia e sistemática apresentados pelos referidos insetos, resolvi estudá-los em relação à fauna do Distrito Federal. Tal limitação ao Distrito Federal resultou do plano geral intitulado "Fauna do Distrito Federal" e relacionado com o auxílio do Conselho Nacional de Pesquisas para o estudo da referida fauna, auxílio êsse dado a mim e a outros colegas meus do Museu Nacional.

Logo de início, porém, notei, ao consultar a grande revisão da subfamília feita por Houlbert (1918), estar a nomenclatura da subfamília em apreço, em estado caótico.

Em face das Regras Internacionais de Nomenclatura Zoológica, os nomes genéricos usados por Houlbert (1918) não podem ser aceitos sem uma prévia discussão, pois o referido autor pouca importância ligou às referidas Regras, conforme será fácil verificar ao ser lido o presente trabalho.

2 — PRINCÍPIOS GERAIS SEGUIDOS NO PRESENTE TRABALHO.

Os princípios seguidos no presente trabalho foram os mesmos por mim indicados no meu estudo de 1946 (Oiticica Filho, 1946:

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(1) O presente trabalho é o número 19 da série: "Fauna do Distrito Federal" (vide texto). Recebido para publicação a 11 de Novembro de 1954.

2-6). Assim peço ao leitor a bondade de referir-se ao trabalho citado para maiores esclarecimentos.

Desejo porém acrescentar que na aplicação dos artigos das Regras Internacionais, fiz sempre uma comparação com o texto legal, em uso, e as resoluções tomadas no último Congresso de Copenhagen e publicados por Hemming em 1953, em livro intitulado: "Copenhagen Decisions on Zoological Nomenclature", cujas indicações bibliográficas encontrará o leitor no fim do presente trabalho em "Copenhagen Decisions, 1953".

Desejo acrescentar também que o trabalho de Blackwelder (1952: 1-32), foi-me também de grande valia no estudo e na compreensão de certos problemas de nomenclatura zoológica, embora em alguns casos não esteja de acôrdo com o referido autor.

3 — DISTINÇÃO TIPOGRÁFICA ENTRE NOMES VÁLIDOS E INVÁLIDOS, NO TEXTO DO PRESENTE TRABALHO.

Como no meu trabalho de 1946 (Oiticica Filho, 1946: 5) os nomes válidos, nomenclatorialmente falando, foram impressos em negrito (por exemplo: **Castnia**). Os nomes inválidos (homônimos ou sinônimos isogenotípicos) foram impressos em itálico (exemplo: *Boisduvalia*).

4 — TRABALHO DE NOMENCLATURA E NÃO DE SISTEMÁTICA ZOOLÓGICA.

Chamo a atenção do leitor ser o presente trabalho apenas de nomenclatura zoológica e baseado no trabalho de sistemática zoológica de Houlbert (1918).

Não encontrará o leitor, no presente trabalho, a minha opinião, nem discussão alguma, a respeito da sistemática adotada por Houlbert.

Assim nos novos nomes propostos por mim, o foram ùnicamente sob o ponto de vista nomenclatorial, sujeitos a uma revisão posterior, quanto às suas validades, ou não, sob o ponto de vista sistemático.

5 — FORMAÇÃO DOS NOVOS NOMES PROPOSTOS NO PRESENTE TRABALHO.

Os novos nomes por mim propostos no presente trabalho, em substituição de homônimos inválidos, são anagramas de tais homônimos, anagramas perfeitos ou não. Exceção única é o novo nome *Uestiudia*, que foi formado latinizando a pronúncia de *Westwoodia*, homônimo por êle substituido.

Aciloa Houlbert, [1918].

Espécie tipo (logótipo): *Castnia inca* Walker, 1854.

Fixada por: Oiticica Filho, agora, por designação subsequente.

Histórico: Houlbert (1918:64, 435-461, [463-467] - est. M'-N'-O'; est. col. 450 (3809), 451, 452, 453 (3816, 3817). Na página 435, Houlbert escreve: "Souche phylétique *Inca*" "(Genre: *Aciloa*)". Após definir o gênero, inclui entre outras a espécie "*Aciloa inca* Walker" e refere-se à página 24 do trabalho de Walker (1854).

Não havendo uma designação clara de Houlbert sôbre a espécie tipo de seu gênero, seleciono aqui para espécie tipo *Castnia inca* Walker, 1854. A seleção de *C. inca* para tipo de *Aciloa,* coincide, propositadamente com o nome dado por Houlbert à sua "Souche phylétique" e cuja citação transcrevi acima.

Sinônimo anisogenotípico: vêr *Athis* Hübner, [1819].

Amauta Houlbert, [1918].

Espécie tipo (logótico): *Castnia cacica* Herrich-Schäffer, [1854].

Fixada por: Oiticica Filho, agora, por designação subseqüente.

Histórico: Houlbert (1918: 62, 121-143, [145-151] - est. I-L, 675-676; est. col. 438, 439, 440). Na pag. 121, Houlbert escreve: "Souche phylétique Cacica" "(Genre *Amauta*)". Inclui no gênero 8 espécies e entre outras a espécie que êle cita assim: "*Amauta Cacica* Boisd. in Herrich-Schaeffer. Aussereuropäischer Schmetterlinge, 1854, Pl. LIV, fig. 143". Na pag. 121-22, escreve Houlbert: "Nous proposons de donner à cet ensemble le nom générique d'*Amauta,* tiré aussi de l'histoire des Incas, et si nous choisissons *Cacica* comme terme de comparaison, c'est que cette espèce, la plus anciennement décrite, est aussi la mieux connue".

Ao meu vêr Houlbert não designa claramente a espécie tipo de *Amauta.* Assim seleciono aqui, como espécie tipo de *Amauta, Castnia cacica* Herrich-Schäffer, 1854. Creio que tal seleção fica de acôrdo com as citações de Houlbert a respeito de *Amauta.*

Athis Hübner, [1819].

Espécie tipo (haplótipo): *Papilio palatinus* Cramer, [1777].

Fixada por: Hübner [1819], por monotipia.

Histórico: Hübner [1819], página 101, cria o gênero e inclui uma única espécie: "21067. *Athis Palatinus* Cram. 159. B.C.".

Kirby (188: Ins. 145) ao tratar do trabalho de Buchecker (1880) escreve: "*Athis* Hübner, pl. XXXVIII. Type *C. fabricii* Godt".

Hemming (1937:159) cita como espécie tipo *"Papilio palatinus* Cram.".

Sinônimo anisogenotípico: *Aciloa* Houlbert. Entre as espécies do seu gênero *Aciloa,* Houlbert (1918) inclui *Aciloa palatinus* Cramer.

Athis Houlbert, 1918

Espécie tipo (logótipo): *Castnia hegemon* Kollar, 1839.

Fixada por: Oiticica Filho, agora, por designação subsequente.

Histórico: Houlbert (1918:63, 287-310, [315-322] - est. W,A'-C', 683-685; est. 453 (3818), 454) cria o gênero. Na página 287, escreve: "Souche phylétique *Hegemon*" "(Genre: *Athis*)". Inclui no gênero 10 espécies e entre as mesmas inclui *Athis hegemon* (Kollar 1839) = *Castnia hegemon* Kollar, 1839, espécie por mim escolhida para tipo e de acôrdo com o nome dado por Houlbert à sua "Souche phylétique".

Homonímia: *Athis* Houlbert, 1918, é homônimo inválido de *Athis* Hübner [1819].

Sinônimo isogenotípico: ver *Hista* Oiticica Filho, novo nome pró *Athis* Houlbert.

Boisduvalia Houlbert, 1918

Espécie tipo (logótipo): *Castnia pellonia* Druce, 1890.

Fixada por: Oiticica Filho, agora, por designação subsequente.

Histórico: Houlbert (1918: 66, 583-612, [613-619] - est. W', X', Y', Z'; est. col. 459, 460) cria o gênero e nêle inclui 18 espécies entre as quais *Castnia pellonia* Druce, 1890.

Na página 583 Houlbert escreve: "Souche phylétique *Pellonia*" "(Genre: *Boisduvalia*)". A minha seleção da espécie tipo está de acôrdo com a citação acima de Houlbert.

Homonímia: *Boisduvalia* Houlbert, 1918 é um homônimo inválido de *Boisduvalia* Robineau-Desvoidy, 1830, Diptera.

Sinônimo isogenotípico: Vêr *Duboisvalia* Oiticica Filho, novo nome pró *Boisduvalia* Houlbert, 1918.

Cabirus Hübner, [1819]

Espécie tipo (logótipo): *Papilio julettus* Stoll, [1790].

Fixada por: Scudder (1875:100), por designação subsequente.

Histórico: Hübner (1819), página 102, cria o gênero e nêle inclui as espécies "1072. *Cabirus Linus* Cram. 257 A" e "1073 *C.*

julettus Stoll 9.1". Acontece que *C. linus* é um Castniidae, porém *C. julettus* é um Hesperiidae.

Scudder (1875:100) seleciona *C. julettus* como tipo do gênero, passando portanto *Cabirus* a ser um gênero de Rhopalocera.

Kirby (1881: Ins. 145), cita tipo "*C. linus*, Cram".

Talbot (1919:33) ao comentar o trabalho de Houlbert (1918), diz ter Scudder selecionado *C. julettus* para tipo do gênero.

Cabirus Buchecker, 1880

Espécie tipo (haplótipo): *Papilio linus* Cramer [1779].

Fixado por: Buchecker, 1880, por monotipia.

Histórico: Buchecker (1880, estampa 24, fig. 29) escreve ao lado do número da figura: "*Cabirus linus* Cram.", portanto única espécie incluida.

Houlbert — 1918:66, 568-578, [581] - est. V'; est. col. 457 (3833) — adota o nome *Cabirus* e na pag. 568 escreve: "Souche phylétique *Linus*" "(Genre: *Cabirus*)". Atribui (página 569) o gênero a Hübner. Inclui 5 espécies entre as quais "*Cabirus Linus* Cramer" e "*Cabirus Heliconioides* Boisd.-H.-Schaeffer", espécie tipo de *Gazera* H-Schäffer.

Homonímia: *Cabirus* Buchecker, 1880 é um homônimo inválido de *Cabirus* Hübner, [1819].

Sinônimo anisogenotípico: Ver *Gazera* Herrich-Schäffer, [1853], nec Houlbert, 1918.

Castnia Fabricius, [1807].

Espécie tipo (logótipo): *Papilio icarus* Cramer, [1775].

Fixada por: Latreille 1810, por seleção subsequente.

Histórico: Autor anônimo, considerado como sendo Illiger, em 1807, escreveu, no Magazin für Insektenkunde, volume 6, páginas 277 a 289, um artigo no qual há um resumo do "Systema Glossatorum", atribuido, pelo próprio [Illiger], a Fabricius. Na página 280 do referido artigo e como um dos novos gêneros de Fabricius, aparece o nome genérico *Castnia* com as seguintes espécies incluidas: "*Pap. Icarus Cram., Cyparissias, Orentes* - 13 Art".

Acontece porém, que no mesmo ano, 1807, em 19 de Dezembro, em artigo de autor anônimo, considerado também como sendo Illiger e publicado no "Allgeimeine Literatur Zeitung", número 303, colunas 1177-1181, há uma notícia detalhada das 34 primeiras estampas do "Sammlung exotischer Schmetterlinge" de Hübner. Na referida notícia ao citar os nomes de Hübner, o autor anônimo [Illiger], cita também, entre parêntesis, o nome genérico que diz

ser de Fabricius. Eis o que há em relação a *Castnia* (coluna 1180): *"P. Urbanus celebris* (*Castnia*) *Licus* mas. *P. Licas* Fabr. *P. Licus Cram"*. Assim *Castnia* [Illiger], 1807, tem como espécie tipo *Papilio licus* Cramer, por monotipia, espécie esta não incluida em *Castnia* Fabricius, 1807, citado acima.

Deste modo nasceu o problema de prioridade entre Castnia [Illiger], 1807 e *Castnia* Fabricius, 1807, ambos nomes publicados no mesmo ano.

No Congresso de Paris, em Junho de 1948, a "Internacional Commission on Zoological Nomenclature", em resolução publicada no "Bulletin of Zoological Nomenclature", vol. 4, páginas 452-459, usa seus plenos poderes e dá prioridade a *Castnia* Fabricius, 1807, resolvendo suprimir da literatura Castnia [Illiger], 1807. Ainda usando seus plenos poderes (página 457), a Comissão coloca o nome *Castnia* na "Official List of Generic Names in Zoology" do seguinte modo: *"Castnia* Fabricius, 1807, *Papilio icarus* Cramer, [1775] (type species selected by Latreille, 1810)". Ver nota abaixo sôbre o nome trivial *icarus*.

Assim o problema de *Castnia* ficou plenamente resolvido no Congresso de Paris, em Junho de 1948. Dou abaixo um *resumo histórico* relativo ao nome *Castnia*.

RESUMO HISTÓRICO:

Fabricius (1807:280), cita *Castnia* e inclui três espécies: *"Papilio Icarus, Cyparissias, Orontes"*.

[Illiger] (1807, coluna 1180), cita *Castnia* e inclui uma única espécie: *Papilio linus* Cramer.

Latreille (1810:440) seleciona *Papilio icarus* Cramer, para a espécie tipo de *Castnia* Fabricius.

Dalman (1824:395) cita como espécie tipo *"C. Licus; Papilio licus* Auctorum". Seleção inválida porque *C. licus* não é espécie original de *Castnia* Fabricius.

Kirby (1892:3), cita como tipo do gênero: *"C. Icarus,* Cram. *(Pap. I)"*.

Houlbert (1918:220) considera *C. licus* como a espécie tipo de *Castnia*.

Hemming (1947) trata da questão de prioridade entre *Castnia* Fabricius 1807 e *Castnia* [Illiger], 1807 e propõe à "International Commission on Zoological Nomenclature" sejam os nomes genéricos *Apatura, Castnia, Emesis, Helicopsis, Neptis, Nymphidium, Pontia* e *Urania* considerados como publicados por Fabricius, sendo portanto os mesmos nomes publicados por [Illiger], em 1807, considerados homônimos dos nomes de Fabricius. Diz que o tipo de *Castnia* Fabricius é: *"Papilio icarus* Cramer, [1775]", que tal seleção foi feita por Latreille em 1810.

A "International Commission on Zoological Nomenclature (1950) usa seus plenos poderes e resolve dar prioridade a *Castnia* Fabricius, 1807, sôbre *Castnia* [Illiger], 1807. Resolve também ser *Papilio icarus* Cramer, [1775], a espécie tipo de *Castnia* Fabricius, selecionada por Latreille (1810:440). *Castnia* [Illiger], é suprimida da nomenclatura zoológica.

Sinônimo isogenotípico: vêr *Elina* Houlbert, 1918.

NOTA SÔBRE O NOME ESPECÍFICO "ICARUS".

Ao publicar a sua resolução sôbre *Castnia* Fabricius, a "International Commission on Zoological Nomenclature" (1950:459) chamou a atenção para o problema de se saber qual o nome trivial mais antigo para a espécie tipo de *Castnia* Fabricius, isto é, para o *Papilio icarus* Cramer, 1775.

Isto porque em 1775 foram publicados quatro trabalhos relacionados com *Papilio icarus* e ser de difícil decisão a prioridade a ser dada a tais trabalhos. Os trabalhos em questão são: 1 — "Papillons exotiques" de Cramer; 2 — "Anmerkungen zu den Hufnagelischen Tabellen der Schmetterlinge", da autoria de von Rottemburg, publicada no vol. 6 do jornal "Naturforscher"; 3 — "Ankündigung eines systematischen Werkes von den Schmetterlingen der Wiener Gegend" de autor anônimo e atribuido a Schiffermüller e Denis; 4 — "Systema Entomologiae" de Fabricius.

Decidiu também a "Int. Commission" colocar o nome específico mais antigo do *Papilio icarus* Cramer, na lista "Official List of Specific Trivial names in Zoology", logo que tal nome tenha sido descoberto.

Castnia Houlbert, 1918

Espécie tipo (ortótipo): *Papilio licus* Drury, 1773.

Fixada por: Houlbert (1918:220), por designação original.

Histórico: Houlbert (1918:63, 218-243, [247-251] - est. S'-T-U, 680-681; pl. 442 (3788), 444) usa o nome *Castnia* para um grupo determinado de Castniidae, tendo como tipo *Papilio licus* Drury, 1773.

Eis o que escreve Houlbert, página 220 ao referir-se aos insetos da sua "Souche phylétique *Licus*" "(Genre: *Castnia*)": "Nous conservons le nom générique de *Castnia* pour les espéces de ce groupe, parce que l'espèce type, ainsi que nous l'avons expliqué a été, de toutes les Castnies, la première décrite et la première figuré". Nesta passagem Houlbert refere-se a *Castnia licus* de Drury.

Eis as espécies incluidas por Houlbert no seu gênero *Castnia*: "*Castnia Licus* Drury; *Castnia Sebai* sp. nov.; *Castnia Licoides* Boisd.; *Castnia Licoidella* Strand; *Castnia Albomaculata* Houlb.; *Castnia Macularifasciata* Houlb.; *Castnia Laura* Druce".

HOMONÍMIA: *Castnia* Houlbert é um homônimo inválido de *Castnia* Fabricius.

SINÔNIMOS ISOGENOTÍPICOS: vêr *Graya* Buchecker, 1880 e *Leucocastnia* Houlbert, 1918.

Castniomera Houlbert, [1918].

ESPÉCIE TIPO (LOGÓTIPO): *Castnia humboldti* Boisduval [1875].

FIXADA POR: Oiticica Filho, agora, por designação subsequente.

HISTÓRICO: Houlbert (1918:63, 199-217, [245] - est. S, 679-680; est. col. 441, 442, 443 (3789, 3790), cria o gênero. Na página 63, cita o gênero *Castniomera* e o divide em 2 *seções*, a saber: "1re Section (*Melanosema*): *Atymnius* e "2e Section (*Phaeosema*): *Humboldti, Salasia, Affinis, Ecuadorensis, Newmanni, Drucei*".

Porém na página 201, subdivide o gênero em 2 subgêneros *Melanosema* e *Phaeosema*, erro evidente, tendo em vista o artigo 9 das Regras Internacionais de Nomenclatura Zoológica, que manda ter o subgênero típico o mesmo nome que o gênero que lhe deu origem.

Na página 199, escreve Houlbert "Souche phylétique *Humboldti*" "(Genre *Castniomera*)" e inclui no gênero, página 207 a espécie "*Castniomera* (*Phaeosema*) *Humboldti* Boisd". Assim seleciono *Castnia humboldti* Boisduval, [1975] como espécie tipo de *Castiomera* Houlbert, 1918, seleção de acôrdo com a citação de Houlbert, referido acima, para a sua "Souche phylétique *Humboldti*".

SINÔNIMO ISOGENOTÍPICO: vêr *Phaeosema* Houlbert, 1918.

SINÔNIMO ANISOGENOTÍPICO: vêr *Melanosema* Houlbert, 1918.

Castnius Hübner, [1819].

ESPÉCIE TIPO (LOGÓTIPO): *Papilio pelasgus* Cramer, [1779].

FIXADA POR: Evans (1937: 15), por designação subsequente.

HISTÓRICO: Hübner ([1819], pag. 102) cria o gênero e nele inclui as espécies: "1074. *Castnius Jupiter* Fabr. Mant. Pap. 794. *Phidias* Cram. 244. A. B.; 1075. *C. Pelasgus* Cram. 202 D; 1076. *C. Lucagus* Cram. 176. G.".

Scudder (1875:135) considera, sem razão, o nome *Castnius* preocupado pelo nome *Castnia*, porém não designa tipo para *Castnius*.

Evans (1937:15) fixa o tipo, selecionando "*Papilio pelasgus* Cramer (1779)".

SINÔNIMO ISOGENOTÍPICO: vêr *Nasca* Houlbert, 1918.

Ceretes Boisduval, [1875].

Espécie tipo (logótipo): *Papilio thais* Drury, 1782.

Fixada por: Oiticica Filho, agora, por designação subsequente.

Histórico: Boisduval 1875, páginas 535-536 define o gênero e nele inclui as espécies: *C. chremes, C. thais, C. fabricii.*

Houlbert (1918:353) escreve: "Souche phylétique *Chremes*" "(Genre: *Ceretes*)". Inclui no gênero 3 espécies e entre elas "*Ceretes thais* Drury" e considera *Papilio chremes* Fabricius e *Corybantes nicon* Hübner como sinônimos de *C. thais* Drury. A minha fixação do tipo está de acôrdo com a citação acima de Houlbert.

Sinônimos isogenotípicos: vêr *Chremes* Buchecker, 1880.

Chremes Buchecker, 1880

Espécie tipo (haplótipo): *Chremes Jonesi* Buchecker, 1880 = = *Papilio thais* Drury, 1782.

Fixada por: Buchecker 1880, por monotipia.

Histórico: Buchecker 1880, estampa 1, representa o macho e a fêmea de uma única espécie que êle chamou de "*Chremes Jomesi.* Buch.", espécie esta que é a mesma figurada anos antes por Drury (1872; estampa 16, fig. 4) com o nome de *Papilio thais.*

Kirby (1881: Ins. 145) cita como tipo "*C. jomesi* (= *Castnia chremes,* Fabr.)".

Sinônimos isogenotípicos: vêr *Ceretes* Boisduval, [1875].

Corybantes Hübner, [1819].

Espécie tipo (logótipo): *Papilio pylades* Stoll, [1784].

Fixada por: Oiticica Filho, agora, por designação subsequente.

Histórico: Hübner ([1819]: 101) cria o gênero e nele inclui seis espécies e, entre as mesmas, a espécie: "1066. *C. Pylades* Cram. 387. A. B.".

Houlbert (1918:177) ao tratar da "Souche phylétique *Pylades*" escreve abaixo do título: "(Genre *Corybantes*)" e inclui no gênero *Corybantes* seis espécies e entre elas "*Corybantes Pylades* Cramer". Na página 178 escreve Houlbert: "Nous avons adapté le nom générique de *Corybantes* pour l'ensemble des *Castniinae* que nous *groupons* autour de *Pylades*".

Como se nota Houlbert não designou claramente o tipo do gênero em apreço. A minha fixação está de acôrdo com as citações acima de Houlbert, de modo que, se alguem julgar que houve fixação de tipo por parte de Houlbert, nenhum problema novo surgirá.

Corybanthes Buchecker, 1880

Espécie tipo (logótipo): *Papilio evalthe* Fabricius, 1775.

Fixada por: Oiticica Filho, agora, por designação subsequente.

Histórico: Buchecker (1880; estampa 20) dá duas figuras (25 e 26) e as denomina: *"Corybanthes Evalthe* Fabr. .....Brasil" e *"Corybanthes* Wagneri Buch.....Columbia".

Das duas espécies escolhi, acima *C. evalthe* para tipo do gênero.

Homonímia: *Corybanthes* Buchecker, 1880, é um homônimo inválido de *Corybantes* Hübner, [1819], de acôrdo com a Opinião 147 das Regras Internacionais de Nomenclatura Zoológica.

Sinônimo isogenotípico: vêr *Xanthocastnia* Houlbert, 1918.

Cyanostola Houlbert, [1918]

Espécie tipo (logótipo): *Castnia diva* Butler, 1870.

Fixada por: Oiticica Filho, agora, por designação subsequente.

Histórico: Houlbert (1918: 65, 512-521, [523] - pl. S', pl. col. 455 (3824)), cria o gênero e nele inclui três espécies, inclusive *"Cyanostola diva* Butler". Na página 512 escreve: "Souche phylétique *Diva"* e logo abaixo "(Genre: *Cyanostola*)".

A minha fixação do tipo do gênero está de acôrdo com a citação acima de Houlbert.

Cyparissias Houlbert, 1918.

Espécie tipo (logótipo): *Papilio dedalus* Cramer, [1775].

Fixada por: Oiticica Filho, agora, por designação subsequente.

Histórico: Houlbert (1918: 62, [79] - 107, [109-119]; pl. C-H, 673-674, pl. col. 437) cria o gênero e nele inclui sete espécies inclusive *"Cyparissias Daedalus* Cramer". Na página 79 escreve "Souche phylétique *Daedalus"* e logo abaixo "(Genre *Cyparissias*)".

Assim a minha fixação de tipo do gênero está de acôrdo com a citação acima de Houlbert.

Sinônimo isogenotípico: *Eupalamides* Hübner, [1819], nec *Eupalamides* Houlbert, 1918.

Doubledaya Buchecker, 1880

Espécie tipo (haplótipo): *Doubledaya zagraeus* Buchecker, 1880 = ? *Castnia zagraea* Felder, 1874.

Fixado por: Buchecker, por monotipia.

Histórico: Buchecker (1880, estampa 23) figura uma espécie à qual dá o nome de *"Doubldaya* [sic] *zagraeus*. Buch. .... Columbia", criando assim o gênero monotípico. Segundo Wagner (1913:18) *D. zagreus* Buchecker é um sinônimo de *Castnia zagraea* Felder, 1874. Segundo Houlbert (1918:626) *D. zagreus* Buchecker não é sinônimo de *Castnia zagraea* Felder.

Kirby (1880: Ins. 145) cita tipo *"C. zagraeus,* Feld".

Talbot (1919:33) diz ter Buchecker proposto o nome para *"zagraea"*.

Homonímia: *Doubledaya* Buchecker, 1880 é um homônimo inválido de *Doubledaya* White, 1850, Coleoptera.

Sinônimos isogenotípicos: *Gazera* Houlbert, 1918, (isogenotípico?) *Gazera* Herrich-Schäffer, [1853].

Zegara (isogenotípico?) Oiticica Filho, novo nome pró *Gazera* Houlbert, 1918.

Erro tipográfico: Em Buchecker (1880) o nome realmente impresso é *"Doubldaya"*, como citado acima, o que é realmente um erro tipográfico.

Duboisvalia Oiticica Filho, novo nome.

Espécie tipo (diátipo): *Castnia pellonia* Druce, 1890.

Fixada por: Oiticica Filho, agora, de acôrdo com o artigo 30, II, f, das Regras Internacionais de Nomenclatura Zoológica.

Histórico: *Duboisvalia* é um novo nome pró *Boisduvalia* Houlbert, 1918, homônimo, inválido, de *Boisduvalia* Robineau-Desvoidy, 1830 (Diptera). Como o tipo de *Boisduvalia* Houlbert, 1918, é *Castnia pellonia* Druce, 1890, tal espécie também será o tipo de *Duboisvalia* de acôrdo com o artigo das Regras, acima citado.

Elina Houlbert, 1918

Espécie tipo (ortótipo): *Papilio icarus* Cramer, [1775].

Fixada por: Houlbert (1918:323) por designação original.

Histórico: Houlbert (1918:64, 323-344, [345-352] - estampas D' G', 685-686) cria o gênero e na página 323 designa, de passagem, o tipo do gênero assim: "Dans certaines espèces et notamment dans le type *Icarus,* . . . .". Na mesma página, como título, escreve: "Souche phylétique *Icarus*". "(Genre: *Elina*)".

Homonímia: *Elina* Houlbert, 1918 é um homônimo inválido de *Elina* Blanchard, 1852 (Lepidoptera, Satyridae).

Sinônimo isogenotípico: *Castnia* Fabricius, 1807.

Enicospila Houlbert, [1918].

Espécie tipo (haplótipo): *Castnia marcus* Jordan, 1908.

Fixada por: Houlbert, 1918, por monotipia.

Histórico: Houlbert (1918:66, 566-567, [581] - estampa V', 699) cria o gênero e nele só inclui uma única espécie: *"Enicospila marcus* Jordan".

Na página 566 escreve Houlbert: "Souche Phylétique *Marcus*" "(Genre: *Enicospila*)".

Erythrocastnia Houlbert, [1918].

ESPÉCIE TIPO (NAGEÓTIPO E ORTÓTIPO): *Papilio harmodius* Stoll, 1779 = *Papilio syphax* Fabricius, 1775.

FIXADA POR: Houlbert (1918) por monotipia e por designação original.

HISTÓRICO: Houlbert (1918:63, 253-255, [275] - estampa V, 681), cria o gênero e nele inclui uma única espécie "*Erythrocastnia harmodius* Cramer", espécie esta que o próprio Houlbert (1918: 254) considera como sendo o *Papilio syphax* Fabricius 1775, porém erroneamente, usa para a mesma o nome específico "harmodius".

Como título escreve (pag. 253) "Souche phylétique *Harmodius*". "(Genre: *Erythrocastnia*)". Na mesma página diz o tipo é "*Harmodius*".

Eupalamides Hübner, [1819].

ESPÉCIE TIPO (HAPLÓTIPO): *Papilio dedalus* Cramer, 1775.

FIXADA POR: Hübner [1819], por monotipia.

HISTÓRICO: Hübner ([1819]: 101) cria o gênero e nele inclui uma única espécie: "1068 *Eupalamides Daedalus* Cram./A. B. *Cyparissias* Fabr. Spec. Pap. 226."

Heming (1937; vol. 2: 195) cita como tipo "*Papilio daedalus* Cram.".

HOMONÍMIA: vêr *Eupalamides* Houlbert, 1918.

SINÔNIMO ISOGENOTÍPICO: *Cyparissias* Houlbert, 1918.

Eupalamides, Houlbert, 1918

ESPÉCIE TIPO (LOGÓTIPO): *Castnia schreibersi* Mikan [1823] = = *Eupalamides ctesiphon* Hübner, [1820].

FIXADA POR: Oiticica Filho, agora, por designação subsequente.

HISTÓRICO: Houlbert (1918:63, 153-167, [169-175] - estampas M-P, 677), cria o gênero e nele inclui três espécies, inclusive "*Eupalamides Schreibersi* Mikan". Na página 153, como título, escreve: "Souche phylétique *Schreibersi*" / "(Genre *Eupalamides*)". Na página 100 de seu trabalho Houlbert após tecer uma série de considerações em torno do gênero *Eupalamides* de Hübner, diz ter Hübner criado o gênero para "*le Daedalus* de Cramer", porém sem nenhuma razão, resolve não usar o nome para o *Papilio dedalus* de Cramer.

HOMONÍMIA: *Eupalamides* Houlbert, 1918, é um homônimo inválido de *Eupalamides* Hübner, [1819].

SINÔNIMO ISOGENOTÍPICO: *Lapaeumides* Oiticica Filho, novo nome pró *Eupalamides* Houlbert, 1918.

Euphrosyne, Buchecker, 1880

Espécie tipo (haplótipo): *Euphrosyne pertyi* Buchecker, 1880 = *Castnia euphrosyne* Perty, [1833].

Fixada por: Buchecker 1880, por monotipia.

Histórico: Buchecker (1880: estampa 19) figura o macho e a fêmea de uma única espécie que êle chama de "*Euphrosyne Pertyi.* Buch.....Brasil".

A espécie acima de Buchecker é a *Castnia euphrosyne* Perty, [1833].

Kirby (1880: Ins, 145) cita tipo "*E. pertii* (= *Castnia euphrosyne,* Perty)".

Homonímia: *Euphrosyne* Buchecker 1880 é um homônimo inválido de *Euphrosyne* Meigen, 1800.

Sinônimos anisogenotípicos: *Xanthocastnia* Houlbert, 1918 e *Corybanthes* Buchecker, 1880, com a espécie tipo *Papilio evalthe* Fabricius cogenérico de *Castnia euphrosyne* Perty.

Feschaeria Oiticica Filho, novo nome.

Espécie tipo (diátipo): *Papilio amycus* Stoll, 1779.

Fixada por: Oiticica Filho, agora, de acôrdo com o artigo 30, II, f, das Regras Internacionais de Nomenclatura Zoológica.

Histórico: *Feschaeria* é um novo nome pró *Schaefferia* Houlbert, 1918, *nec* Absolon 1900. Como o tipo de *Schaefferia* é o *Papilio amycus,* Stoll, [1779], tal espécie também é o tipo de *Feschaeria* de acôrdo com o artigo acima citado das Regras Internacionais.

Sinônimo isogenotípico: *Schaefferia* Houlbert, 1918 (nec Absolon, 1900).

Frostetola Oiticica Filho, novo nome.

Espécie tipo (diátipo): *Castnia gramivora* Schaus, 1896.

Fixada por: Oiticica Filho, agora, de acôrdo com o artigo 30, II, f, das Regras Internacionais de Nomenclatura Zoológica.

Histórico: *Frostetola* é um novo nome pró *Tephrostola* Houlbert, 1918, nec Bezzi 1913. Como o tipo de *Tephrostola* é *Castnia gramivora* Schaus, 1896, tal espécie também será o tipo de *Frostetola,* de acôrdo com o artigo acima citado das Regras Internacionais.

Sinônimo isogenotípico: *Tephrostola* Houlbert, 1918 ("nec" Bezzi, 1913).

Gazera Herrich-Schäffer, [1853].

Espécie tipo (haplótipo): *Gazera heliconioides,* Herrich-Schäffer, [1853].

Fixada por: Herrich-Schäffer, [1853], por monotipia.

Histórico: Herrich-Schäffer ([1853], Ser I, "heft" 4, fig. 15) representa um castnídeo e na contra capa que grupava o "heft" 4, êle a denominava: "*Gazera heliconioides* Boisd. Brasil". O nome foi por êle atribuido a Boisduval, talvez a êle enviado por carta. (Ver nota bibliográfica a respeito de Herrich-Schäffer).

Talbot (1919:33) diz ter Boisduval criado o gênero "*Gazera*" para "*linus* Cram.", opinião errônea.

Sinônimo anisogenotípico: *Cabirus* Buchecker, 1880, nec Hübner, [1819].

Gazera Houlbert, 1918.

Espécie tipo (logótipo): *Castnia zagraea* Felder, 1874.

Fixada por: Oiticica Filho, agora, por designação subsequente.

Histórico: Houlbert (1918:66, 621-638, [639-643] - estampa AA-CC, 703, estampa colorida 461) cria o gênero e o atribui a Boisduval. Inclui 10 espécies e entre elas "*Gazera zagraea* Felder". Na página 621, como título, escreve: "Souche phylétique *Zagraea*" / "(Genre: *Gazera*)". Assim a minha fixação do tipo dada acima fica de acôrdo com o conceito acima de Houlbert.

Homonímia: *Gazera* Houlbert, 1918, é um homônimo, inválido, de *Gazera* Herrich-Schäffer, [1853].

Sinônimo isogenotípico: *Zegara* Oiticica Filho, novo nome pró *Gazera* Houlbert, 1918, "nec" Herrich-Schäffer, [1853].

Doubledaya Buchecker, 1880 (isogenotípico?), nec White, 1850.

Geyeria, Buchecker, [1880].

Espécie tipo (logótipo): *Castnia decussata* Godart, [1823].

Fixada por: Oiticica Filho, agora, por designação subsequente.

Histórico: Buchecker (1880, estampa 25, fig. 30-31 e estampa 26, fig. 32) representa três castnideos com os seguintes nomes: "*Geyeria decussata* Latr.", "*Geyeria discoidalis*. Buch" e "*Geyeria castnioides* Buch."

Sinônimo anisogenotípico: *Ypanema* Houlbert, 1918.

Erro tipográfico: Dalla Torre (1913:4) grafa o nome "*Geyera* [sem o i] Buchecker..."

Graya Buchecker, 1880

Espécie tipo (logótipo): *Papilio licus* Drury, 1773.

Fixada por: Oiticica Filho, agora, por designação subsequente.

Histórico: Buchecker (1880; estampas 15 (fig. 20), 16, 17 e 18) funda o gênero em 4 espécies e entre elas inclui "*Graya licus*

Cram." que é o *Papilio licus* de Drury e a qual escolhi acima para tipo do gênero.

Homonímia: *Graya* Buchecker, 1880, é um homônimo inválido de *Graya* Bonaparte, 1856 (Aves).

Sinônimos isogenotípicos: *Castnia* Houlbert, 1918, "nec" Fabricius, 1807 e *Leucocastnia* Houlbert, 1918.

Graya Houlbert, 1918

Espécie tipo (haplótipo): *Castnia dalmannii* Gray, 1838.

Fixada por: Houlbert (1918:63, 283-284, [315] - estampa W, 683) cria o gênero e nele só inclui uma única espécie "*Graya Dalmannii* C. R. Gray". Houlbert atribui o gênero a Buchecker, porém *Graya* Buchecker, 1880, não continha, originalmente, a espécie *C. dalmanni*, tipo de *Graya* Houlbert.

Homonímia: *Graya* Houlbert, 1918, é um homônimo, inválido, de *Graya* Bonaparte, 1856 (Aves).

Sinônimo isogenotípico: *Yagra* Oiticica Filho, novo nome, pró Graya Houlbert, 1918.

Haemonides Hübner, [1819].

Espécie tipo (haplótipo): *Papilio cronis* Cramer, [1777].

Fixada por: Hübner, [1819], por monotipia.

Histórico: Hübner ([1819]: 101) cria o gênero e nele inclui uma espécie: "1069 *Haemonides Cronis* Cram. 60. C.f. 178. A.", a qual é portanto o tipo do gênero.

Houlbert (1918:65, 525-545, [555] - estampa T', est. colorida 456) aceita e amplia o gênero para seis espécies. Cita "Cronis Cram". como o tipo do gênero, na página 525. Na mesma página, como título, escreve: "Souche phylétique *Cronis*" / "(Genre *Haemonides*)".

Heming (1937; vol. 2:203) cita como tipo "(*Papilio cronis* Cram)".

Herrichia Buchecker, 1880

Espécie tipo (haplótipo): *Castnia acraeoides* Gray, 1832.

Fixada por: Oiticica Filho, agora, por designação subsequente.

Histórico: Buchecker (estampa 3, fig. 2; estampa 2, fig. 4 e est. 26) figura e denomina, respectivamente, as seguintes espécies: "*Herrichia cronis* Cram", "*Herrichia acraeoides* Boisduv" e "*Herrichia paradoxa* Herrich".

Houlbert (1918:65, 546-551, [579] - estampa U', estampa colorida 462) aceita o gênero e na página 547 o atribui a Buchecker,

porém, só incluindo, no mesmo, uma única espécie: *"Herrichia acraeoides* Gray". Na página 546, como título, escreve: "Souche phylétique *Acraeoides*" / "(Genre: *Herrichia*)".

A minha fixação de tipo está em acôrdo com a citação acima transcrita de Houlbert.

Homonímia: *Herrichia* Buchecker, 1880, é um homônimo inválido de *Herrichia* Standinger, 1871 (Lepidoptera, Oecophoridae).

Sinônimo isogenotípico: *Riechia* Oiticica Filho, novo nome, pró *Herrichia* Buchecker, 1880.

Hista Oiticica Filho, novo nome.

Espécie tipo (diátipo): *Castnia hegemon* Kollar, 1839.

Fixada por: Oiticica Filho, agora, de acôrdo com o artigo 30, II, f, das Regras Internacionais de Nomenclatura Zoológica.

Histórico: *Hista* é um novo nome, pró *Athis* Houlbert, 1918, "nec" Hübner, 1819. Com o tipo de *Athis* é *Castnia hegemon*, Kollar, 1839, tal espécie também é o tipo de *Hista*, de acôrdo com o citado artigo das Regras.

Imara Houlbert, [1918].

Espécie tipo (logótipo): *Castnia pallasia* Eschscholtz, 1821.

Fixada por: Oiticica Filho, agora, por designação, subsequente.

Histórico: Houlbert (1918:65, 469-479, [495-497] - est. P', Q'; est. col. 457, 458; 693), cria o gênero e nele inclui três espécies inclusive *"Imara pallasia* Eschscholtz", espécie por mim escolhida acima para tipo do gênero. Houlbert (1918:469) escreve, como título: "Souche phylétique *Pallasia*" / "(Genre: *Imara*)". Como se nota a minha fixação do tipo coincide com o nome dado por Houlbert à sua "Souche phylétique".

Ircila Houlbert, [1918].

Espécie tipo (haplótipo e ortótipo): *Castnia hecate* Herrich-Schäffer, 1854.

Fixada por: Houlbert, 1918, por monotipia e por designação original.

Histórico: Houlbert (1918:65, 552-554, [579] - est. U', 697), cria o gênero e nele inclui uma única espécie: *"Ircila hecate* Herrich-Schaeffer". Na página 552 Houlbert designa *"Hecate"* para tipo do gênero. Na mesma página, como título, escreve Houlbert: "Souche phylétique *Hecate*" / "(Genre: *Ircila*)".

Lapaeumides Oiticica Filho, novo nome.

Espécie tipo (diátipo): *Castnia schreibersi* Mikan 1822 = = *Eupalamides ctesiphon* Hübner, [1820].

Fixada por: Oiticica Filho, agora, de acôrdo com o artigo 30, II, f, das Regras Internacionais de Nomenclatura Zoológica.

Histórico: *Lapaeumides* é um novo nome pró *Eupalamides* Houlbert, 1918, nec Hübner, [1819]. Como o tipo de *Eupalamides* Houlbert é *Castnia schreibersi* Mikan, 1822, automaticamente, pelo artigo das Regras Internacionais citado acima, também é o tipo de *Lapaeumides*.

Sinônimo isogenotípico: *Eupalamides* Houlbert, 1918, nec Hübner, [1819].

Leucocastnia Houlbert, [1918].

Espécie tipo (logótipo): *Papilio licus* Drury, 1773.

Fixada por: Oiticica Filho, agora, por designação subsequente.

Histórico: Houlbert (1918:680), ao catalogar sistemàticamente a subfamília *Castniinae,* escreve: "6e Genre: *Castnia* Fabr." e logo abaixo: "(Sous Genre: *Leucocastnia,* Houlb.)". Depois dá a lista das espécies, incluidas por êle no texto de seu trabalho de 1918, no gênero por êle chamado de *Castnia.*

Entre tais espécies acha-se "*C. licus,* Drury, a qual foi por mim tomada para tipo, do chamado sub-gênero.

Assim *Leucocastnia* vem tomar o lugar de *Castnia* Houlbert, nec Fabricius.

Note-se que *Leucocastnia* não se acha registrado nem no texto do trabalho de Houlbert e nem no índice do mesmo trabalho. Tal nome também não está registrado no Nomenclator Zoologicus de Neave.

Sinônimos isogenotípicos: *Graya* Buchecker, 1880 e *Castnia* Houlbert, 1918 (nec Fabricius, 1807).

Melanosema Houlbert, 1918
(Sub-gênero de *Castniomera*)

Espécie tipo (haplótipo): *Castnia atymnius* Dalman, 1824.

Fixado por: Houlbert, 1918, por monotípia.

Histórico: Houlbert (1918:201) subdivide o gênero *Castniomera* em 2 subgêneros e no primeiro dêles *Melanosema* inclui uma única espécie (vêr páginas 63, 202 e 679) "*Castniomera* (*Melanosema*) *Atymnius* Dalm" (pag. 202).

Sinônimo anisogenotípico: *Castniomera* Houlbert, 1918.

Nasca Houlbert, 1918

Espécie tipo (logótipo): *Papilio pelasgus* Cramer, [1779].

Fixada por: Oiticica Filho, agora, por designação subsequente.

Histórico: Houlbert (1918: 67, 645-651, [659] - estampa DD, 704; est. colorida 462) cria o gênero e nele inclui três espécies, incluindo entre as mesmas: "*Nasca pelasgus* Cram". Na página 645 escreve, como título: "Souche phylétique *Pelasgus*" / "(Genre: *Nasca*)". A minha fixação do tipo dada acima coincide com o nome dado por Houlbert à sua "Souche phylétique".

Sinônimo isogenotípico: *Castnius* Hübner, [1819].

Orthia Herrich-Schäffer, [1853].

Espécie tipo (haplótipo): *Castnia therapon* Kollar, 1839 = = *Orthia paradoxa* Herrich-Schäffer, [1853].

Histórico: Herrich-Schäffer ([1853], ser. 1, livr. 4, fig. 16-17 e capa do fascículo) figura uma espécie de castnídeo a qual denomina, na capa do referido fascículo 4 ("heft 4"), de "*Orthia paradoxa* Boisd. Brasil", única espécie incluida em *Orthia* no referido fascículo.

Houlbert (1918: 65, 501-511, [523] - est. S', 694) reconhece o gênero e nele inclui 5 espécies incluindo "*Orthia therapon* Kollar". Atribui, erroneamente, o nome genérico a Boisduval.

Paysandisia Houlbert, [1918].

Espécie tipo (haplótipo): *Castnia josepha* Oberthür, 1914.

Fixada por: Houlbert, 1918, por monotipia.

Histórico: Houlbert (1918:64, 311-314, [321] - est. C', 685) cria o gênero e nele inclui uma única espécie: "*Paysandisia Josepha* Obthr". Na página 311 escreve Houlbert: "Souche Phylétique *Josepha*" / "(Genre: Paysandisia)".

Phaeosema Houlbert, 1918

(Subgênero de *Castniomera* Houlbert, 1918).

Espécie tipo (logótipo): *Castnia humboldti* Boisduval, [1875].

Fixada por: Oiticica Filho, agora, por designação subsequente.

Histórico: Houlbert (1918:63, 201, 679) ao desdobrar o seu gênero *Castniomera* em 2 subgêneros o faz erradamente, pois chama os dois subgêneros de *Melanosema* e *Phaeosema* sem levar em conta o artigo 9 das Regras Internacionais de Nomenclatura Zooló-

gica que manda ter o subgênero típico o mesmo nome do gênero que lhe deu origem. No subgênero *Phaeosema* inclui Houlbert seis espécies e entre elas *"Castniomera (Phaeosema) Humboldti"*, espécie por mim escolhida acima para tipo de *Phaeosema*.

Sinônimo isogenotípico: *Castniomera* Houlbert, 1918.

Prometheus Hübner, [1824].

Espécie tipo (haplótipo): *Papilio cochrus* Fabricius, 1787 = = *Prometheus casmilus* Hübner, [1824].

Fixada por: Hübner, [1824], por monotipia.

Histórico: Hübner ([1824], *2*, estampa [143]) figura um castnídeo ao qual chama de *"Prometheus Casmilus"*.

Houlbert (1918:65, 484-493, [499] - estampa R', 694; est. colorida 457) aceita o gênero e nele inclui duas espécies, entre as quais *"Prometheus Cochrus* Fabr.".

Kirby (1881: Ins. 145) cita tipo: *"C. cochrus*, Fabr.".

Hemming (1937, *2*: 247) cita como tipo do gênero *"Prometheus casmilus* Hübn.".

A espécie *P. casmilus* de Hübner é o *Papilio cochrus* Fabricius, 1787.

Riechia Oiticica Filho, novo nome.

Espécie tipo (diátipo): *Castnia acraeoides* Gray, 1832.

Fixada por: Oiticica Filho, agora, de acôrdo com o artigo 30, II, f, das Regras Internacionais de Nomenclatura Zoológica.

Histórico: *Riechia* é um novo nome pró *Herrichia* Buchecker, 1880, nec Staudinger, 1871. Como o tipo de *Herrichia* é a *Castnia acraeoides* Gray, 1832, automàticamente, pelo artigo das Regras Internacionais citado acima, tal espécie é também o tipo de *Riechia*.

Sinônimo isogenotípico: *Herrichia* Houlbert, 1918 (nec Staudinger, 1832).

Schaefferia Houlbert, 1918

Espécie tipo (logótipo): *Papilio amycus* Cramer, [1779].

Fixada por: Oiticica Filho, agora, por designação subsequente.

Histórico: Houlbert (1918: 64, 421-429, [443] - estampa L', 690; est. colorida 455) cria o gênero e nele inclui três espécies, entre as quais *"Schaefferia Amycus* Cramer". Na página 421, como título, escreve Houlbert: "Souche Phylétique *Amycus*" / "(Genre: *Schaefferia*)". A espécie tipo por mim escolhida acima coincide com o nome dado por Houlbert à sua "Souche phylétique".

Homonímia: *Schaefferia* Houlbert, 1918, é um homônimo, inválido, de *Schaefferia* Absolon, 1900 (Collembola).

Sinônimo isogenotípico: *Feschaeria* Oiticica Filho, novo nome, pró *Schaefferia* Houlbert, 1918.

Spilopastes Houlbert, [1918].

Espécie tipo (haplótipo): *Castnia galinthias* Hoppfer, 1856.

Fixada por: Houlbert (1918) por monotipia.

Histórico: Houlbert (1918: 65, 480-483, [497] - estampa Q' 693) cria o gênero e nele inclui uma única espécie *"Spilopastes Galinthias* Hoppfer". Na página 480 escreve, como título, "Souche Phylétique *Galinthias*" / "(Genre: *Spilopastes*)".

Sympalamides Hübner, [1823].

Espécie tipo (haplótipo): *Sympalamides mimon* Hübner, 1823.

Fixada por: Hübner [1823], por monotipia.

Histórico: Hübner [1823], 2 estampas [142] representa um castnídeo ao qual denomina de *"Sympalamides mimon"*.

Houlbert (1918: 64, 373-397, [403] - estampa J', 687, estampa colorida 447) aceita o gênero e nele inclui 4 espécies, entre as quais *"Sympalamides mimon* Hübn.". Na página 373 escreve, como título "Souche Phylétique *Phalaris*" / "(Genre: *Sympalamides*)" e em nota ao pé da página: "La morphe que nous avons choisie comme type, pour donner son nom à cette souche phylétique, est le *Phalaris* Godart (= *Mimon* Hübner) e non pas le *Phalaris* selon Fabricius.

Hemming (1937:259) cita como tipo "(*Sympalamides mimon* Hübner)".

Nome específico da espécie tipo — Segundo a maioria dos autores *Sympalamides mimon* Hübner, [1823], é considerada como sinônimo de *Papilio phalaris* Fabricius, 1793. Houlbert (1918:373-379, [401] - fig. 132, [403] - estampa J') foi o primeiro a chamar a atenção para o erro evidente existente na sinonímia acima. Fabricius descreveu o seu *Papilio phalaris* baseado numa figura de um trabalho iconográfico e inédito de Jones. Eis a citação de Fabricius: *"Papilio Phalaris* Jon. fig. pict. 3, Tab. 75, fig. 2". Ora, Donovan (1823, 2:95, est. 47, f. 1, 2) reproduz fielmente, segundo ele próprio diz, as figuras de Jones as quais Fabricius se refere. Houlbert (1918: fig. 132) reproduz a estampa de Donovan.

Pela figura de Jones nota-se imediatamente não ser a espécie de Fabricius um castnídeo e portanto não ser *Sympalamides mimon* Hübner, [1823].

Note-se ser *Castnia phalaris* Godart [1824], igual a *Sympalamides mimon* Hübner, [1823].

Tephrostola Houlbert, 1918

Espécie tipo (logótipo): *Castnia gramivora* Schaus, 1896.

Fixada por: Oiticica Filho, agora, por designação subsequente.

Histórico: Houlbert (1918:66, 557-561, 698; est. col. 462) cria o gênero e nele inclui três espécies, entre as quais, "*Tephrostola Gramivora* Schaus". Na página 557, como título, escreve Houlbert: "Souche Phylétique *Gramivora*" / "(Genre: *Tephrostola*)". Assim a minha escolha, acima, do tipo do gênero coincide com o nome dado por Houlbert à sua "Souche phylétique".

Homonímia: *Tephrostola* Houlbert, 1918, é um homônimo, inválido, de *Tephrostola* Bezzi, 1913 (Diptera).

Sinônimo isogenotípico: *Frostetola* Oiticica Filho, novo nome, pró *Tephrostola* Houlbert, 1918.

Tosxampila Oiticica Filho, novo nome.

Espécie tipo (diátipo): *Castnia mimica* Felder, 1874.

Fixada por: Oiticica Filho, agora, de acôrdo com o artigo 30, II, f, das Regras Internacionais de Nomenclatura Zoológica.

Histórico: *Tosxampila* é um novo nome pró *Xanthospila* Houlbert, 1918, nec Fairmaire, 1884. Como o tipo de *Xanthospila* é *Castnia mimica*, tal espécie será também o tipo de *Tosxampila* de acôrdo com o artigo das Regras acima citado:

Sinônimo isogenotípico: *Xanthospila* Houlbert, 1918 (nec Fairmaire, 1884).

Uestiudia Oiticica Filho, novo nome.

Espécie tipo (diátipo): *Castnia pelopia* Druce, 1890.

Fixada por: Oiticica Filho, agora, de acôrdo com o artigo 30, II, f, das Regras Internacionais de Nomenclatura Zoológica.

Histórico: *Uestiudia* é um novo nome pró *Westwoodia* Houlbert, 1918, nec Brullé, 1846. Como o tipo de *Westwoodia* é *Castnia pelopia* Druce, 1890, tal espécie será também o tipo de *Uestiudia*, de acôrdo com o citado artigo das Regras.

Sinônimo isogenotípico: *Westwoodia* Houlbert, 1918.

Westwoodia Houlbert, 1918.

Espécie tipo (logótipo): *Castnia pelopia* Druce, 1890.

Fixada por: Oiticica Filho, agora, por designação subsequente.

Histórico: Houlbert (1918: 67, 652-658, [659] - estampa DD, 705; est. col. 462) cria o gênero e nele inclui três espécies, entre as

quais "*Westwoodia Pelopia* Druce". Na página 652 Houlbert escreve, como título, "Souche Phylétique *Pelopia*". / "(Genre: *Westwoodia*)". A minha escolha, acima, do tipo está de acôrdo com o nome dado por Houlbert à sua "Souche phylétique".

Homonímia: *Westwoodia* Houlbert, 1918, é um homônimo, inválido, de *Westwoodia* Brullé 1846 (Hymenoptera).

Sinônimo isogenotípico: *Uestiudia* Oiticica Filho, novo nome, pró *Westwoodia* Houlbert, 1918.

Xanthocastnia Houlbert, [1918].

Espécie tipo (logótipo): *Papilio evalthe* Fabricius, 1775.

Fixada por: Oiticica Filho, agora, por designação subsequente.

Histórico: Houlbert (1918:63, 257-273, [277-282] - estampas X-Z, 681-682; est. colorida 445) cria o gênero e nele inclui 8 espécies, entre as quais "*Xanthocastnia Evalthe* Fabr.". Na página 257 escreve Houlbert, como título, "*Souche Phylétique Evalthe*" / "(Genre *Xanthocastnia*). Assim a minha fixação do tipo feita acima está de acôrdo com o nome dado por Houlbert à sua "Souche phylétique".

Sinônimo isogenotípico: *Corybanthes* Buchecker, 1880 (nec Hübner, [1819]).

Xanthospila Houlbert, 1918

Espécie tipo (logótipo): *Castnia mimica* Felder, 1874.

Fixada por: Oiticica Filho, agora, por designação subsequente.

Histórico: Houlbert (1918:66, 562-565, [579] - estampa U', 698) cria o gênero e nele inclui duas espécies das quais uma é "*Xanthospila Mimica* Felder". Na página 562, como título, escreve Houlbert: "Souche Phylétique *Mimica*" / "(Genre: *Xanthospila*)". Assim a minha fixação do tipo está de acôrdo com o nome dado por Houlbert à sua "Souche phylétique".

Homonímia: *Xanthospila* Houlbert, 1918, é um homônimo inválido de *Xanthospila* Fairmaire, 1884 (Coleoptera).

Sinônimo isogenotípico: *Tosxampila* Oiticica Filho, novo nome pró *Xanthospila* Houlbert, 1918 (nec Fairmaire, 1884).

Yagra Oiticica Filho, novo nome.

Espécie tipo (diátipo): *Castnia dalmannii* Gray, 1838.

Fixada por: Oiticica Filho, agora, de acôrdo com o artigo 30, II, f, das Regras Internacionais de Nomenclatura Zoológica.

Histórico: *Yagra* é um novo nome pró *Graya* Houlbert, 1918, "nec" Bonaparte, 1856. Como o tipo de *Graya* Houlbert é *Castnia dalmannii* Gray, 1838, tal espécie também é o tipo de *Yagra*.

Sinônimo isogenotípico: *Graya*, Houlbert, 1918 (nec Bonaparte, 1856).

Ypanema Houlbert, 1918

Espécie tipo (logótipo): *Castnia hübneri* Gray, 1838.

Fixada por: Oiticica Filho, agora, por designação subsequente.

Histórico: Houlbert (1918: 64, 405-420, [431] - estampa K', 689; est. colorida 456) cria o gênero e nele inclui quatro espécies, entre as quais "*Ypanema Huebneri* Latreille in Cuvier". Na página 405, como título, escreve Houlbert: "Souche Phylétique *Hübneri*" / "(Genre: *Ypanema*)". Assim o tipo por mim fixado acima está de acôrdo com o nome dado por Houlbert à sua "Souche phylétique".

Sinônimo anisogenotípico: *Geyeria* Buchecker, 1880. Segundo Houlbert (1918:64, 405-420, 689) o tipo de *Geyeria* (*Castnia decussata* Godart, 1824) pertence ao mesmo gênero que o tipo de *Ypanema*.

Sôbre o nome específico da espécie tipo: A espécie tipo de *Ypanema*, *Castnia hubneri* Gray, 1918, é conhecido como *Castnia huebneri* Latreille 1830 e assim está registrado em Dalla Torre (1913:13) e em Houlbert (1918:407) como "*Ypanema Huebneri* Latreille in Cuvier", todos dando a paternidade do nome a Latreille. Houlbert, no entanto, já na página 408 do seu trabalho, chama a atenção para a nota de Latreille (1930:438, nota) na qual diz terem sido os lepidópteros da estampa 20 a êle comunicados por Boisduval e que as descrições dos mesmos a Boisduval também pertencem.

Acontece porém que os nomes publicados por Latreille são nomes vernáculos e portanto sem valor em nomenclatura zoológica. No caso em apreço está (pag. 439): "*Castnie Hübner*".

Portanto foi necessário achar o primeiro autor que se referiu a espécie em questão para ela usando o nome genérico e específico latinizado. Tal autor foi Gray em 1838 [Set. 1838], página 146, que escreve: "*C. Hubneri*, Boisd.", dando a referência certa e atribuindo a paternidade do nome, como deveria ser, a Boisduval, se este último autor tivesse usado o nome latinizado.

Assim o nome do tipo deve ser escrito como o foi por mim: "*Castnia hubneri* Gray, 1838".

Note-se ter Kollar (1839: 216, est. 12; fig. 4) descrito "*Castnia sternbergi*", espécie igual a *Castnia hubneri*. A prioridade porém, cabe a Gray, conforme pude apurar pesquisando com cuidado as datas muito próximas dos trabalhos de Gray e de Kollar.

Zegara Oiticica Filho, novo nome.

Espécie tipo (diátipo): *Castnia zagraea* Felder, 1874.

Fixada por: Oiticica Filho, agora, de acôrdo com o artigo 30, II, f, das Regras Internacionais de Nomenclatura Zoológica.

Histórico: *Zegara* é um novo nome pró *Gazera* Houlbert, 1918, nec Herrich-Schäffer, [1853]. Como o tipo de *Gazera* Houlbert é *Castnia zagraea* Felder, 1874, tal espécie também é o tipo de *Zegara*, de acôrdo com o artigo acima citado das Regras.

Sinônimo isogenotípico: *Gazera* Houlbert, 1918 (nec Herrich-Schäffer, [1853]).

LISTA SISTEMÁTICA DOS GÊNEROS DA SUBFAMÍLIA CASTNIINAE

A lista abaixo é feita para pôr em ordem os nomes genéricos dos *Castniinae* de acôrdo com a classificação de Houlbert, 1918 e com as mudanças nos nomes genéricos decorrentes do presente trabalho. A numeração dos gêneros segue Houlbert (1918:673-705).

1.° gênero: **Eupalamides** Hübner, [1819].
Logótipo: *Papilio dedalus* Cramer, [1775].
Isogenotípico: *Cyparissias* Houlbert, 1918.

2.° gênero: **Amauta** Houlbert, [1918].
Logótipo: *Castnia cacica* Herrich-Schäffer, [1859].

3.° gênero: **Lapaeumides** Oiticica Filho, novo nome.
Diátipo: *Eupalamides ctesiphon* Hübner, [1820].
Isogenotípico: *Eupalamides* Houlbert, 1918, "nec" Hübner, [1819].

4.° gênero: **Corybantes** Hübner, [1819].
Logótipo: *Papilio pylades* Stoll, [1784].

5.° gênero: **Castniomera** Houlbert, [1918].
Logótipo: *Castnia humboldti* Boisduval, [1875].
Isogenotípico: *Phaeosema* Houlbert, 1918, (subgênero de *Castniomera*).
Anisogenotípico: *Melanosema* Houlbert, 1918 (subgênero de *Castniomera*).
Haplótipo: *Castnia atymnius* Dalman, 1824.

6.° gênero: **Leucocastnia** Houlbert, [1918].
Logótipo: *Papilio licus* Drury, 1773.

Isogenotípicos: *Graya* Buchecker, 1880 ("nec" Bonaparte, 1856) e *Castnia* Houlbert, 1918 ("nec" Fabricius, 1807).

7.° gênero: **Erythrocastnia** Houlbert, [1918].
Ortótipo e haplótipo: *Papilio syphax* Fabricius, 1775.

8.° gênero: **Xanthocastnia** Houlbert, [1918].
Logótipo: *Papilio evalthe* Fabricius, 1775.
Isogenotípico: *Corybanthes* Buchecker, 1880 ("nec" Hübner, [1819]).

9.° gênero: **Yagra** Oiticica Filho, novo nome.
Diátipo: *Castnia dalmannii* Gray, 1838.
Isogenotípico: *Graya* Houlbert, 1918 ("nec" Bonaparte, 1856, Aves).

10.° gênero: **Hista** Oiticica Filho, novo nome.
Diátipo: *Castnia hegemon* Kollar, 1839.
Isogenotípico: *Athis* Houlbert, 1918 (nec Hübner, [1819]).

11.° gênero: **Paysandisia** Houlbert, [1918].
Haplótipo: *Castnia josepha* Oberthür, 1914.

12.° gênero: **Castnia** Fabricius, [1807].
Logótipo: *Papilio icarus* Cramer, [1775].
Isogenotípico: *Elina* Houlbert, 1918 ("nec" Blanchard, 1852, Lepidoptera, Satyridae).

13.° gênero: **Ceretes** Boisduval, [1875].
Haplótipo: *Papilio thais* Drury, 1782.
Isogenotípico: *Chremes* Buchecker, 1880.

14.° gênero: **Sympalamides** Hübner, [1823].
Haplótipo: *Sympalamides mimon* Hübner, [1823].

15.° gênero: **Geyeria** Buchecker, [1880].
Logótipo: *Castnia decussata* Godart, 1823.
Anisogenotípico: *Ypanema* Houlbert, 1918 — Logótipo: *Castnia hubneri* Gray, 1938.

16.° gênero: **Feschaeria** Oiticica Filho, novo nome.
Diátipo: *Papilio amycus* Cramer, [1779].
Isogenotípico: *Schaefferia* Houlbert, 1918 ("nec" Absolon, 1900, Collembola).

17.° gênero: **Athis** Hübner, [1819].
HAPLÓTIPO: *Papilio palatinus* Cramer, [1779].
ANISOGENOTÍPICO: *Aciloa* Houlbert, 1918 — LOGÓTIPO: *Castnia inca* Walker, 1854.

18.° gênero: **Imara** Houlbert, [1918].
LOGÓTIPO: *Castnia pallasia* Eschscholtz, 1821.

19.° gênero: **Spilopastes** Houlbert, [1918].
HAPLÓTIPO: *Castnia galinthias* Hoppfer, 1856.

20.° gênero: **Prometheus** Hübner, [1824].
HAPLÓTIPO: *Papilio cochrus* Fabricius, 1787.

21.° gênero: **Orthia** Herrich-Schaffer, [1853].
HAPLÓTIPO: *Castnia therapon* Kollar, 1839.

22.° gênero: **Cyanostola** Houlbert, [1918].
LOGÓTIPO: *Castnia diva* Butler, 1870.

23.° gênero: **Haemonides** Hübner, [1819].
HAPLÓTIPO: *Papilio cronis* Cramer, [1777].

24.° gênero: **Riechia** Oiticica Filho, novo nome.
DIÁTIPO: *Castnia acraeoides* Gray, 1832.
ISOGENOTÍPICO: *Herrichia* Buchecker, 1880 ("nec" Staudinger, 1871, Lepidoptera, Oecophoridae).

25.° gênero: **Ircila** Houlbert, [1918].
ORTÓTIPO E HAPLÓTIPO: *Castnia hecate* Herrich-Schäffer, [1854].

26.° gênero: **Frostetola** Oitica Filho, novo nome.
DIÁTIPO: *Castnia gramivora* Schaus, 1896.
ISOGENOTÍPICO: *Tephrostola* Houlbert, 1918 ("nec" Bezzi, 1913, Diptera).

27.° gênero: **Tosxampila** Oiticica Filho, novo nome.
DIÁTIPO: *Castnia mimica* Felder, 1874.
ISOGENOTÍPICO: *Xanthospila* Houlbert, 1918 ("nec" Fairmaire, 1884).

28.° gênero: **Enicospila** Houlbert, [1918].
HAPLÓTIPO: *Castnia marcus* Jordan, 1908.

29.° gênero: **Gazera** Herrich-Schäffer, [1853].
Haplótipo: *Gazera heliconioides* Herrich-Schäffer, 1853.
Anisogenotípico: *Cobirus* Buchecker, 1880 ("nec" Hubner, 1819, Lepidoptera, Hesperiidae).

30.° gênero: **Dubcisvalia** Oiticica Filho, novo nome.
Diátipo: *Castnia pellonia* Druce, 1890.
Isogenotípico: *Boisduvalia* Houlbert, 1918 ("nec" Robineau-Desvoidy, 1830, Diptera).

31.° gênero: **Zegara** Oiticica Filho, novo nome.
Diátipo: *Castnia zagraea* Felder, 1874.
Isogenotípico: *Gazera* Houlbert, 1918 ("nec" Herrich-Schäffer, [1853]) e *Doubledaya* Buchecker, 1880 (nec White, 1850, Coleoptera) — isogenotípico?

32.° gênero: **Castnius** Hübner, [1819].
Logótipo: *Papilio pelasgus* Cramer, 1779.
Isogenotípico: *Nasca* Houlbert, 1918.

33.° gênero: **Uestiudia** Oiticica Filho, novo nome.
Diátipo: *Castnia pelopia* Druce, 1890.
Isogenotípico: *Westwoodia* Houlbert, 1918 ("nec" Brullé, 1846).

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Os dados acima e a data a eles relativa foram tirados de fotocópia de um exemplar do British Museum, Natural History, fotocópia das capas originais, *capas essas que trazem impressos os nomes dos exemplares figurados nas estampas nelas contidas.* Assim os nomes dados às figuras, por Herrich-Schäffer, foram publicados na mesma ocasião em que foram publicadas as respectivas figuras. Devo tais fotocópias ao meu estimado amigo J. G. Franclemont, quando estive trabalhando no "United States National Museum", em Washington, E. U. A.

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Rev. Brasil. Ent. 3: 169-172 - Julho, 1955 - São Paulo

NOVA ESPÉCIE DE *BITHORACOCHAETA* STEIN. (DIPTERA, MUSCIDAE) (1)

DALCY DE O. ALBUQUERQUE

Museu Nacional, Rio de Janeiro, D. F.

Bithoracochaeta plumata, sp. n.

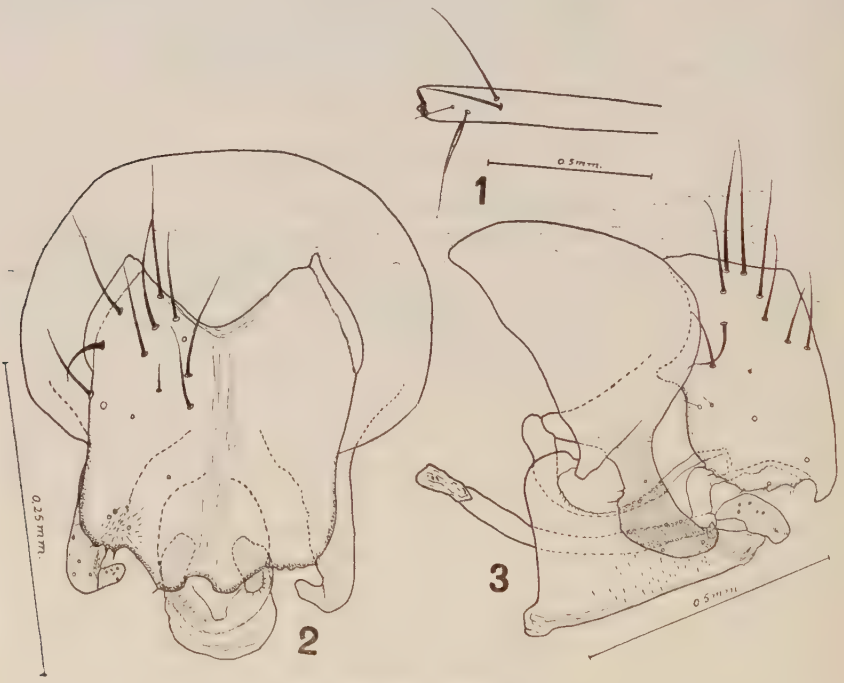
MACHO — Comprimento total: 5 mm.

CABEÇA — Espaço interocular com bordos paralelos e medindo a altura do ocelo anterior, cerca de 3,1 da largura total da cabeça. Vita frontal negra. Órbitas anteriores, posteriores, faciália e genas, prateadas. Há quatro pares de cerdas frontais, sendo o par mediano cruzado, forte, porém mais fraco que a cerda vertical interna. Triângulo ocelar prateado e se prolongando até a extremidade anterior da vita frontal. Posteriormente ao triângulo ocelar, há uma área castanha. Cerdas ocelares fortes e divergentes. Há no triângulo ocelar, entre os ocelos posteriores, um pêlo longo. Cerda vertical interna forte e retrodirigida. Cerda vertical externa pequena e divergente. Cerdas pós-ocelares robustas e divergentes. Cerdas pós-verticais internas convergentes e pouco menores que as cerdas pós-ocelares. Cílios pós-oculares pouco menores que o par de cerdas vertical externo. Faciália e gena, estreitas. Vibrissa forte, na margem oral e com uma vibrissal acima. Antenas castanhas, com o ápice do segundo artículo e a base do terceiro, alaranjados. O segundo artículo antenal mede cerca de 1,8 do comprimento do terceiro. Arista plumosa, castanha, com um pequeno seguimento amarelo logo acima da base. Palpos e probóscida castanho escuro.

TÓRAX cinzento, dorsalmente acastanhado, apresentando quatro faixas, que coincidem com as cerdas dorsocentrais, as acrosticais e as laterais, sendo estas últimas mais largas. A faixa mediana (que coincide com as cerdas acrosticais), atinge quase o ápice do escutelo. Cerdas dorsocentrais 1+2. Cerdas acrosticais pré-suturais

(1) Trabalho realizado sob os auspícios do Conselho Nacional de Pesquisas. Recebido para publicação a 28 de Janeiro de 1955.

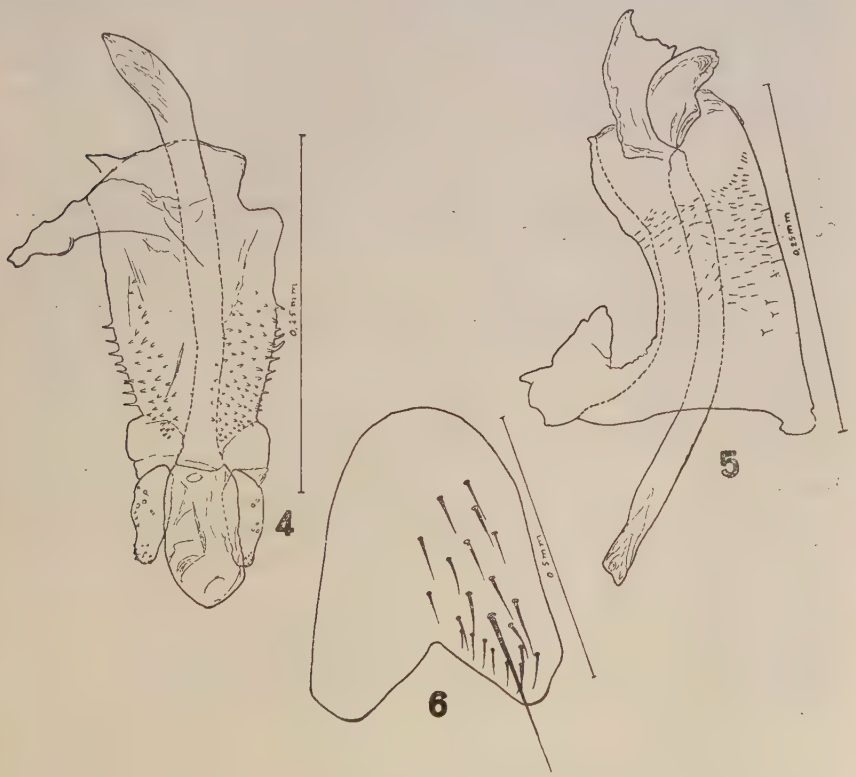
em duas fileiras de cílios e as pós-suturais em três. Duas cerdas umerais (sendo uma fraca); cerda pós-umeral ciliforme e cerda presutural robusta. Duas cerdas intra-alares posteriores, (a anterior ciliforme), duas supra-alares (a posterior ciliforme), duas pós-supra-alares, duas notopleurais e quatro mesopleurais. Protórax e proto-espiráculo com duas cerdas, sendo as prototorácicas afastadas à base. Esternopleura com seis cerdas fortes, arrumadas em triângulo equilátero. Escutelo com um par de cerdas lateral basal fraco e um par apical robusto e cruzado. Calípteros brancos amarelados, o torácico medindo cerca de 2,8 do comprimento do alar, que é reduzido. Balancim amarelo.



Bithoracochaeta plumata, sp. n.
Fig. 1 - Ápice da tíbia I, vista dorsal; Fig. 2 - Genitália, de frente; Fig. 3 - Genitália, de perfil

Pernas — Coxa I amarela com a parte posterior negra. Trocanter amarelo. Fêmur enegrecido nos 2/3 basais, sendo que a face ventral é amarela. Perna II e III com as coxas enegrecidas. Fêmures com ápices negros. Tarsos escurecidos. Fêmur I com uma série de cerdas dorsal, anterodorsal e anteroventral. Tíbia com uma cerda anteroventral mediana, longa e forte. Face dorsal e postero-dorsal com uma cerda pré-apical, inseridas quase à mesma altura.

Abaixo dessas cerdas, pré-apicalmente há uma cerda anterodorsal, uma anteroventral e uma pequena posterodorsal (ciliforme). Face ventral com duas cerdas apicais mediocres. Pretarso com uma cerda basal ventral, bem mais robusta que as cerdas apicais da tíbia. Unhas negras com a base amarela. Pulvilos amarelos, tão longos quanto as unhas. Fêmur II com uma série de cerdas anteriores, espaçadas, mediocres e interrompidas no têrço apical. Face anteroventral com uma serie de cerdas curtas, espaçadas e interrompidas no têrço apical. Face posterior com duas cerdas pré-



Bithoracochaeta plumata, sp. n.
Fig. 4 - Pênis e anexos, de frente; Fig. 5 - Pênis e anexos, de perfil; Fig. 6 - 5.º externito.

apicais, inseridas obliquamente. Face póstero-ventral com uma série de cerdas espaçadas, que não atinge o ápice, apresentando medianamente três cerdas longas e fortes. Tíbia com uma cerda anteroventral submediana. Face póstero-ventral com uma cerda mediana. Face póstero-dorsal com uma cerda preapical fraca, (pouco distanciada as apicais). Face anterior e póstero-ventral com uma

cerda apical forte. Unhas e pulvilos como no par anterior. Fêmur III com uma série de cerdas fortes, espaçadas, na face anterodorsal. Face anteroventral com uma série de cerdas fortes, espaçadas, porem mais curtas que as cerdas da face anterodorsal. Face anterior com uma série de cerdas curtas, espaçadas que se duplicam na metade apical, porem não atingem o ápice. Face póstero-dorsal com uma cerda pré-apical. Face posterior com uma série de cerdas curtas, interrompidas antes do ápice. Face póstero-ventral com uma série de cerdas, limitadas aos 2/3 basais, apresentando apenas duas fortes (as que limitam o terço médio do fêmur). Tíbia medianamente com uma cerda anterodorsal, uma póstero-dorsal, uma póstero-ventral (inseridas quase ao mesmo nível) e uma anteroventral, inserida pouco acima das cerdas citadas. Face anterodorsal e dorsal com uma cerda pré-apical, sendo esta última inserida acima da cerda anterodorsal. Faces anteroventral, ventral e póstero-ventral, com uma cerda apical. Pretarso com uma cerda basal ventral mais longa que quaisquer das cerdas apicais da tíbia. Unhas e pulvilos como nos pares anteriores.

Asas hialianas.

Abdomen longo, cinzento, com os tergitos apresentando dorsalmente uma faixa mediana e duas manchas laterais arredondadas, castanhas. Quarto tergito com apenas as manchas arredondadas. As manchas laterais são situadas nas bases dos tergitos. Segundo tergito com cerdas laterais. Terceiro com cerdas laterais e discais. Quarto com cerdas laterais, discais e apicais marginais. Hipopígio não saliente.

Material examinado: Holótipo macho n.° 4694, Juiz de Fora, Salvaterra (Estado de Minas Gerais) Brasil, S. Lopes col., I-1945.

Bithoracochaeta plumata, sp. n. pertence ao grupo que apresenta quatro cerdas submedianas na tíbia III. Pela coloração das pernas e, sobretudo, pela longa plumosidade das antenas, *Bithoracochaeta plumata,* sp. n. pode facilmente ser separada das espécies próximas.

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SÔBRE A SISTEMÁTICA DA SUBFAMÍLIA PHLEBOTOMINAE RONDANI (DIPTERA, PSYCHODIDAE) (1)

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Deixando de parte o trabalho de Newstead (1911) que procurou agrupar os flebótomos malteses, sem contudo dar nomes aos grupos propostos, verifica-se que a primeira tentativa de classificação se deve a França (1919). Baseado nos caracteres da terminália do macho, êste autor divide o gênero *Phlebotomus* em dois subgêneros: *Phlebotomus,* s. restr., compreendendo *P. papatasi* (Scop., 1786) e *P. dubosqui* Nev.-Lem., 1906, e *Newsteadia,* incluindo *P. sergenti* Parr., 1913, *P. ingrami* Newst., 1914, *P. minutus* Rond., 1843, *P. simillimus* Newst., 1914, *P. perniciosus* Newst., 1911 e *P. mascisttii* Grassi, 1908 (= ? *P. perniciosus*). Não designou, porém, subgenótipos.

No ano seguinte França e Parrot (1920), verificando a preocupação do nome *Newsteadia* França, 1919, (*nec* Green, 1902), propõem o de *Sergentomyia* em substituição, sem ainda designar tipo. Por outro lado, mencionam um terceiro subgênero, *Neophlebotomus,* para as formas vizinhas de *Sergentomyia,* mas providas de espinho no lobos laterais (gonopófises inferiores) e, sem mencionar outras espécies, assinalam que *P. malabaricus* Ann., 1910 "talvez" pudesse ser incluído neste subgênero.

Logo depois, França (1921) divide o gênero *Phlebotomus* em três subgêneros ainda baseados nos caracteres da terminália do macho e expressamente designa-lhes os tipos: *Phlebotomus* Rond. e Berte, 1840, tipo *P. papatasi* (Scop. 1786), *Sergentomyia* França 1920, tipo *P. minutus* Rond., 1843 e *Lutzia,* n. subgen., tipo: *P. longipalpis* Lutz e Neiva, 1912.

(1) Trabalho do Departamento de Parasitologia, da Faculdade de Medicina de Ribeirão Preto, da Universidade de São Paulo (Diretor: Prof. M. Pereira Barretto). Recebido para publicação a 24 de Fevereiro de 1955

No mesmo ano França e Parrot (1921) aceitam os três subgêneros supra mencionados e lhes acrescentam mais dois: *Phophlebotomus* e *Brumptomyia,* para os quais não designam tipos; por outro lado incluem *P. minutus* Rond., 1843, juntamente com *P. perturbans* Meigère, 1909, *P. antennatus* Newst., 1912 e *P. fallax* Parrot, 1921 no subgênero *Prophlebotomus* e *P. major* no subgênero *Sergentomyia;* finalmente, abandonam, como já fizera França (1921), o nome *Neophlebotomus* e incluem *P. malabaricus* em *Sergentomyia.*

Ainda no mesmo ano Larrousse (1921), embora mostrando-se pouco inclinado a adotá-la, transcreve a classificação de França (1920) e designa *P. perniciosus* Newst. para tipo de *Sergentomyia* e *P. malabaricus* Ann. para tipo de *Neophlebotomus.*

França (1924) reconhece a pré-ocupação do nome *Lutzia* França, 1919 (*nec* Theobald, 1903) e propõe o de *Lutzomyia* para substituí-lo.

Dyar (1929) estudando a fauna americana de flebótomos, aceita a designação de tipos feita por França (1921); por outro lado, designa *P. minutus* para tipo de *Prophlebotomus* e inclui êste subgênero na sinonímia de *Sergentomyia;* ainda mais, julgando que *Neophlebotomus,* com *P. malabaricus* para tipo, substitui o conceito de *Sergentomyia* de França e Parrot (1920), revalida aquele subgênero e nele inclui as espécies americanas até então consideradas *Sergentomyia;* além disso, aceita os subgêneros *Brumptomyia* (considerado *P. brumpti* Larrousse, 1920 como tipo) e *Lutzomyia;* finalmente, cria *Shannonomyia* com *P. panamensis* Shann. 1926 para tipo (por monotipia). Assim, segundo Dyar (1929) o gênero *Phlebotomus* compreende seis subgêneros: *Phlebotomus,* tipo *P. papatasi* (Scop), *Sergentomyia* França e Parrot, 1920, tipo *P. minutus* Rond. (sin.: *Prophlebotomus,* tipo *P. minutus* Rond.), *Neophlebotomus,* tipo *P. malabaricus* Ann. (sin.: *Sergentomyia* França e Parrot, 1921, tipo *P. perniciosus*), *Brumptomyia,* tipo P. *brumpti* Larr., *Lutzomyia,* tipo *P. longipalpis* Lutz e Neiva e *Shannonomyia,* tipo *P. panamensis* Shann.

Nitzulescu (1931) classifica aos flebótomos do Velho e Novo Continente em cinco subgêneros, baseados em caracteres da armadura bucal e da espermateca da fêmea, caracteres êstes cuja importância para o reconhecimento específico havia sido posto em relêvo por Adler e Theodor (1926, 1927) e por Sinton (1927): *Sintonius* (tipo *P. hospiti,* Sinton, 1924), *Brumptius* (tipo *P. minutus* Rond., 1843), *Larroussius* (tipo *P. major* Ann., 1910), *Phlebotomus* tipo *P. papatasi* (Scop., 1786) e *Adlerius* (tipo *P. chinensis* Newst., 1916).

Costa Lima (1932) aceita a argumentação de Dyar (1929) considerando *Prophlebotomus* como sinônimo de *Sergentomyia* e

Neophlebotomus como subgênero distinto. Embora ache que é difícil senão impossível uma classificação dos flebótomos americanos em subgêneros definidos, erige *Pintomyia,* n. subg., para *P. fischeri* Pinto, 1926.

Parrot (1934) abandona vários dos subgêneros propostos anteriormente, inclusive por êle próprio, e aceita apenas dois para as espécies do Velho Mundo: *Phlebotomus* s. str. (tipo: *P. papatasi* Scop.) e *Prophlebotomus* (tipo *P. minutus* Rond.).

Mangabeira (1941, 1942) cria uma série de subgêneros para espécies americanas: *Evandromyia* (tipo: *P. infraspinosus* Mang., 1941), *Psychodopygus* (tipo *P. unisetosus* Mang., 1941), *Viannamyia* (tipo: *P. tuberculatus* Mang., 1941), *Pressatia* (tipo: *P. triacanthus* Mang., 1942), *Castromyia* (tipo: P. *castroi* Barr. e Cout., 1941) todos baseados principalmente na terminália do macho; além disto aceita outros anteriormente criados, como *Brumptomyia, Pintomyia* e *Shannonomyia.*

Dampf (1944) coloca *Prophlebotomus* e *Brumptius* na sinonímia de *Sergentomyia,* mas não aceita a de *Neophlebotomus,* neste particular concordando com Dyar (1929). Por outro lado menciona, como se aceitasse para espécies americanas, vários dos subgêneros anteriormente criados, entre os quais *Brumptomyia, Shannonomyia, Castromyia* e *Pintomyia.* Finalmente acha justificável separarem-se os flebótomos dos outros *Psychodidae* em uma família distinta *Phlebotomidae.*

Addis (1945) cria mais um subgênero neotrópico: *Dampfomyia,* tendo para tipo *P. anthophorus* Addis, 1945.

Kirk e Lewis (1946) aceitam com modificações a classificação de Parrot (1934) e reconhecem três subgêneros para as espécies de flebótomos da região etiópica: *Phlebotomus* s. str., *Sintonius* Nitz. 1931 e *Prophlebotomus* França e Parrot, 1921.

Theodor (1948), a exemplo do que fazem Dyar (1929) e Costa Lima (1932) e usando de argumentos idênticos aos de que se serviram êstes autores, rejeita o nome *Prophlebotomus* como sinônimo de *Sergentomyia.* Discordando agora dêles, Theodor (1948) rejeita também *Neophlebotomus* ainda como sinônimo de *Sergentomyia,* visto que *P. malabaricus,* considerado tipo de *Neophlebotomus,* pertence ao mesmo grupo de *P. minutus,* tipo de *Sergentomyia.*

Por outro lado, Theodor (1948), retomando e modificando suas sugestões anteriores (Theodor, 1931), propõe dividir a subfamília *Phlebotominae* Rond. 1840 — reduzida ao gênero *Phlebotomus* "s. lat. auct.", em quatro gêneros: *Phlebotomus* Rond. e Berte, 1840 (tipo *P. papatasi* (Scop., 1786), *Sergentomyia* França e Parrot, 1921 (tipo *P. minutus* Rond., 1843), *Lutzomyia* França, 1924 (tipo: *P. longipalpis* Lutz e Neiva, 1912) e *Brumptomyia* França e Parrot, 1921 (tipo *P. brumpti* Larr., 1920). Os dois últimos são

reservados para as espécies americanas, enquanto as espécies do Velho Mundo são incluídas em *Phlebotomus* e *Sergentomyia,* gêneros que divide em vários subgêneros a saber: I. gênero *Phlebotomus*: subgêneros: 1. *Phlebotomus* Rond , 1843 [tipo *P. papatasi* (Scop., 1786)], 2. *Paraphlebotomus,* n. subg. (tipo *P. sergenti* Parr., 1917), 3. *Symphlebotomus,* n. subg. (tipo: *P. martini* Parr., 1936), 4. *Larroussius* Nitz., 1931 (tipo: *P. major* Ann., 1910), 5. *Adlerius* Nitz., 1931 (tipo: *P. chinensis* Newst., 1916), 6. *Euphlebotomus,* n. subg. (tipo: *P. argentipes* Ann. e Brun., 1908), 7. *Anaphlebotomus,* n. subg. (tipo: *P. stantoni* Newst., 1917), 8. *Australophlebotomus,* n. subg., (tipo: *P. brevifilis* Tonn., 1935), 9. *Spelaeophlebotomus* (tipo *P. gigas* Parr. e Schw., 1937); II. gênero *Sergentomyia*: subgêneros: 1. *Sergentomyia* França e Parrot, 1920 (tipo *P. minutus* Rond. 1943), 2. *Sintonius* Nitz, 1931 (tipo: *P. hospitii* Sinton, 1924), 3. *Spelaeomyia,* n. subgen. (tipo *P. mirabilis* Parr. e Wans. 1939).

Mais recentemente, Parrot (1951) critica acerbamente os autores que discordam de sua opinião, particularmente Theodor (1948). Não aceita a elevação de *Phlebotomus* "s. lat.", à categoria de subfamília, *Phlebotominae,* e sua divisão em gêneros. Não aceita também a sinonímia de *Prophlebotomus* e *Neophlebotomus* em *Sergentomyia.* Argumentando que a figura apresentada por França e Parrot (1920) para ilustrar uma *Sergentomyia,* completa a definição do gênero e que esta figura representa a armadura genital de *P. perniciosus,* julga que esta espécie é o tipo "indicado" do subgênero *Sergentomyia* e conclui que: 1) a designação de *P. minutus* como tipo de *Sergentomyia* feita por França (1921) é incorreta; 2) que *Prophlebotomus,* tendo para tipo *P. minutus,* é um subgênero válido, tendo para sinônimos *Sergentomyia* (tipo *P. perniciosus*) e *Larroussius* (tipo *P. major*), 3. que *Neophlebotomus* é "nomen nudum". Aceita apenas dois subgêneros para as espécies do velho mundo: *Phlebotomus* e *Prophlebotomus.*

No mesmo ano, Kirk e Lewis (1951) discutem a sistemática dos flebótomos e, tendo presente os argumentos opostos de Theodor (1948) e Parrot (1951), modificam um pouco a classificação anteriormente proposta (Kirk e Lewis, 1946) e aceitam para as espécies da região etiópica três subgêneros: *Phlebotomus* restr., *Sintonius* Nitz. 1931 e *Sergentomyia* França e Parrot 1920 (sin. *Prophlebotomus* França e Parrot, 1921; Parrot, 1934, Kirk e Lewis, 1946).

O rápido bosquejo das tentativas de classificação dos flebotomíneos que vimos de fazer mostra que o problema não é simples. Como assinala Parrot (1951), todas as tentativas feitas se chocam com a dificuldade de descobrir caracteres capazes de servir de bases sólidas para divisões e subdivisões genéricas válidas e dura-

douras. Esta dificuldade que existe quando se considera a fauna de uma região zoogeográfica, cresce quando se procura integrar as espécies de todo o mundo em um sistema coerente. Isto se deve a duas causas principais: plasticidade do grupo e falta de conhecimento maior das espécies. De fato, em um certo número de casos falta-nos a certeza da co-especificidade de macho e fêmea descritos como pertencentes a determinada espécie. Ainda mais, de um número relativamente grande de formas principalmente americanas, só se conhece um sexo e é possível que, em alguns casos, espécies descritas como distintas com base em um e outro sexo sejam em realidade sinônimas. Demais, o número de espécies até agora conhecidas constitui, a nosso ver, fração do total de representantes da fauna flebotômica, pois vastas áreas do globo permanecem virgens de exploração, enquanto outras têm tido sua fauna pouco estudada. Finalmente, na grande maioria dos casos não se conhecem os caracteres das larvas e pupas, caracteres êstes que fornecem certamente elementos importantes para a classificação.

Conseqüentemente, apesar da grande soma de dados acumulados no decorrer destas últimas décadas, ainda é difícil uma classificação racional e inteiramente satisfatória dos flebótomos.

Mas, existindo 166 espécies no Velho Mundo (Parrot, 1951) e 199 espécies no Hemisfério Ocidental (além de diversas variedades, algumas das quais provàvelmente boas espécies) é evidentemente vantajosa, para não dizermos imperiosa a sua distribuição em grupos.

Pensamos poder fugir ao dilema abstendo-nos de classificações elaboradas que admitem muitas divisões e subdivisões e adotando um número mínimo de agrupamentos e neste particular estamos com Parrot (1951). Contrariando, porém, a opinião dêste autor, julgamos inaceitáveis seus conceitos subgenéricos e injustas suas críticas a Theodor (1948) quando êste considera o gênero *Phlebotomus* como subfamília dividindo-a em gêneros.

Parece-nos inteiramente justificável o ponto de vista de Theodor (1948) quando procura dar maior realce ao grupo de que nos ocupamos. Cremos oportuna do ponto de vista puramente sistemático e útil na prática a elevação de alguns dos subgêneros propostos até aqui à categoria de gêneros e adotamos o princípio que norteia Theodor (1948). No entanto, discordamos dêste autor em vários pontos. Aliás, sua classificação se refere de maneira especial às espécies do Velho Mundo e as espécies do Novo Mundo são deixadas à margem, talvez em virtude da falta de conhecimento mais amplo da nossa fauna por parte de Theodor (1948). Em primeiro lugar, os flebotomíneos do Hemisfério Ocidental não se incluem apenas nos gêneros *Brumptomyia* e *Lutzomyia*, existindo pelo menos um grupo muito homogênio de espécies afins de um dos gru-

pos exóticos de *Sergentomyia*. Êste gênero inclui mesmo a maioria dos representantes de nossa fauna. Por outro lado, *Lutzomyia* não é taxinômicamente equivalente aos outros grupos; o nome poderia, no máximo, ser restrito a um pequeno número de formas cujos caracteres gerais são os do gênero *Sergentomyia,* mas que diferem um pouco do seu genótipo. Assim, aceitamos apenas três gêneros admitidos por Theodor (1948): *Phlebotomus* (tipo: *P. papatasi* (Scop.), *Sergentomyia* (tipo: *P. minutus* Rond.) e *Brumptomyia* (tipo: *P. brumpti* Nitz.). Incluimos ainda o gênero *Warileya* Fairch. e Hert., 1948 (tipo: *W. phlebotomanica* Fairch. e Hert., 1948) descrito posteriormente.

Caberia aqui uma pergunta: poderiamos levar um pouco mais adiante a ação de Theodor (1948) e adotar uma família especial, *Phlebotomidae* Rond., 1856 para o antigo gênero *Phlebotomus,* como quer Dampf (1944)? Êste autor lembra em apôio de sua opinião o que sucedeu com a subfamília *Ceratopogoninae* elevada à categoria de família — *Ceratopogonidae,* distinta de *Chironomidae.* A idéia é interessante, mas se quizessemos fazer dos flebotomíneos uma família à parte, teriamos, para ser coerentes, que cindir a família *Psychodidae* em várias outras. Colocar os flebotomíneos em uma família e deixar todos os outros gêneros na família *Psychodidae* seria dar excessiva importância sistemática áquele grupo de importância médica. Em trabalho sôbre a sistemática da família *Psychodidae* abordaremos mais demoradamente êste assunto.

Discutiremos a seguir a situação dos gêneros *Sergentomyia, Brumptomyia* e *Warileya,* os únicos que, a nosso ver, têm representantes no Hemisfério Ocidental.

SERGENTOMYIA (1)

Sergentomyia França, 1920 ("nov. nom. pro" *Newsteadia* França 1919), in França e Parrot, 1920, Bull. Soc. Path. Exot., 13: 699 (*Phlebotomus,* subgen. *Sergentomyia*); tipo: *Phlebotomus minutus* Rond., 1843, designado por França (1921).

Newsteadia França, 1919 (*nec* Green, 1902), Broteria. Ser. Zool. 17: 148 (*Phlebotomus,* subgen. *Newsteadia*).

Prophlebotomus França e Parrot, 1921, Arch. Inst. Pasteur Afrique Nord, 1: 281 (*Phlebotomus,* subgen. *Prophlebotomus*); tipo: *Phlebotomus minutus* Rond., 1843, designado por Dyar (1929).

Brumptius Nitzulescu, 1931, Ann. Paras. Hum. Comp., 9: 271; tipo: *P. minutus* Rond., 1843 por designação original.

(1) O autor de *Sergentomyia* é França, de acôrdo com o artigo 21 das R.I.N.Z., pois, embora França e Parrot (1920) mencionem *Sergentomyia* como novo gênero e se refiram que êste nome é proposto em substituição a *Newsteadia,* expressamente o atribuem (p. 699) a França.

Já vimos que o tipo de *Sergentomyia* França, 1920 (1) é *P. minutus,* designação feita por França (1921) e aceita pela maioria dos autores (Dyar 1929, Costa Lima, 1932, Dampf, 1944, Barretto, 1947, Theodor, 1948, Kirk e Lewis, 1951). A designação de *P. perniciosus* Newst., 1911 para tipo do mesmo gênero, feita posteriormente por Larrousse (1921), aceita por Parrot (1934), Kirk e Lewis (1946) não se justifica.

Pretende Parrot (1951) que o tipo de *Sergentomyia* seja *P. perniciosus* Newst. argumentado da seguinte maneira: 1) a figura apresentada por França e Parrot (1920) como ilustrativa da "armadura genital de um *Sergentomyia* completa a definição dêste subgênero: 2) aquela figura representa incontestàvelmente a terminália do macho de *P. perniciosus;* 3) conseqüentemente *perniciosus* é o tipo "indicado" de *Sergentomyia.*

Estamos de acôrdo quanto ao fato de que uma figura complete a definição, descrição ou caracterização de um gênero, subgênero ou espécies. Não contestamos que a figura referida represente a terminália do macho de *P. perniciosus.* O que negamos é a conclusão de que, em virtude das duas razões expostas, *perniciosus* seja o tipo de *Sergentomyia,* isto é, que a anexação de uma figura de uma espécie como ilustração à diagnose de um subgênero no qual havia várias espécies por ocasião da descrição original, valha perante as Regras Internacionais de Nomenclatura Zoológica como designação de tipo. O artigo 30, que governa a designação ou indicação de tipos prevê no item I (caso em que o tipo é aceito *ùnicamente* com base na publicação original) quatro alternativas e em nenhuma delas o caso de *Sergentomyia* pode ser incluído, ainda que se queira dar uma interpretação muito ampla ao texto legal. Aliás, o último período do referido artigo 30 é claríssimo e não deixa a menor sombra de dúvida quanto à falta de fundamento da opinião de Parrot (1951). Reza o texto: "Mention of a species as an illustration or example of a genus (ou subgênero acrescentamos nós) does not constitute selection of a type."

Portanto, *P. perniciosus* não pode ser aceito como tipo de *Sergentomyia* por designação original e a designação subseqüente de *P. minutus* feita por França (1921) é válida, de acôrdo com alínea *g* do artigo 30 e não pode ser modificada. A ação de Larrousse (1921) não pode prevalecer, pois, apesar do seu trabalho haver sido publicado no mesmo ano, êle é indiscutìvelmente posterior ao de França (1921).

Vejamos agora o caso de *Neophlebotomus* França e Parrot, 1920. Dissemos que êste nome foi usado em conexão com um certo número de caracteres e que seus autores, não indicaram quais as espécies incluídas no novo subgênero, limitando-se a assinalar que *P. malabaricus* Ann., 1910 talvez nêle pudesse entrar. Ora, de acôr-

do com a alínea II, e, do artigo 30 das Regras Internacionais de Nomenclatura Zoológica, devem ser excluídas na escolha de tipos as espécies às quais o autor de um gênero (e também de um subgênero) se referiu com dúvidas. A ação de Larrousse (1921), escolhendo *malabaricus* para tipo de *Neophlebotomus*, não pode assim prevalecer. Aliás, já anteriormente França e Parrot (1921) haviam incluído *malabaricus* em *Sergentomyia* não mais mencionando *Neophlebotomus*. Assim não assiste razão a Dyar (1929), ao revalidar êste subgênero para as espécies americanas, e a Costa Lima (1932), Dampf (1944), Theodor (1948) e outros, quando aceitam a designação de Larrousse (1921) acima referida e, considerando *P. malabaricus* congenérico de *P. minutus*, colocam *Neophlebotomus* na sinonímia de *Sergentomyia*. *Neophlebotomus* é um "nomen nudum", como assinala Parrot (1951), e, nestas circunstâncias, deve desaparecer das listas sinonímicas.

Analisemos ainda a situação de *Prophlebotomus* Franca e Parrot, 1921. Êste subgênero resultou da divisão do subgênero *Sergentomyia*. Seus autores, como vimos, não lhe designaram tipo, mas nele incluiram, entre outras espécies, *P. minutus*. Como assinalam Dyar (1929) e Theodor (1948), êste procedimento é inadmissível diante do que preceitua o artigo 29 das Regras Internacionais da Nomenclatura Zoológica que diz: "If a genus is divided into two or more restricted genera, its valid name must be retained for one of the restricted genera. If a type was originally established for said genus, the generic name is retained for the restricted genus containing said type", isto é, se um gênero (ou subgênero) é dividido em dois ou mais, a espécie tipo tem de permanecer no gênero restrito que tenha o mesmo nome do gênero primitivo. Assim, se *Sergentomyia* "s. lat." foi dividido em *Sergentomyia* "s. restr." e *Prophlebotomus*, seu tipo, *P. minutus*, não poderá ser transferido para êste último devendo permanecer como tipo de *Sergentomyia* "s. restr.". Conseqüentemente a ação de França e Parrot (1921) incluindo *minutus* em *Prophlebotomus*, tornou-o sinônimo de *Sergentomyia*. Não assiste, pois, razão a Parrot (1934), Kirk e Lewis (1946) e Parrot (1951). Aliás, posteriormente Kirk e Lewis (1951), reconhecendo justa a argumentação de Dyar (1929) e Theodor (1948), consideram *Neophlebotomus* como sinonímo de *Sergentomyia*.

Finalmente *Brumptius* Nitzulescu, 1931, tendo como tipo *P. minutus* por designação original deve ser considerado sinônimo de *Sergentomyia*.

Constitui êste gênero um grupo muito heterogêneo e, conseqüentemente difícil de caracterizar. Possìvelmente as espécies nele

incluídas aqui não sejam todas congenéricas de *S. minuta*, devendo, no futuro, ser distribuídas em gêneros diversos, quando maior conhecimento tivermos da fauna americana. No estado atual, porém, julgamos que qualquer tentativa de divisão genérica ou mesmo subgenérica corre o risco de resvalar em artificialidade. Apresentamos a seguir a lista das espécies consideradas válidas.

1 — *abonnenci* Floch e Chassignet, 1947, Publ. Inst. Pasteur Guyane, n.º 157, p. 1
2 — *aclydifera* Fairchild e Hertig, 1952. Ann. Ent. Soc. Amer., 45: 510
3 — *almazani* Galliard, 1934, Ann. Paras. Hum. Comp., 12: 193
4 — *alphabetica* Fonseca, 1936, Rev. Ent., 6: 327
5 — *amarali* Barretto e Coutinho, 1940, An. Fac. Med. Univ. S. Paulo, 16: 134.
6 — *amazonensis* Root, 1934, Amer. J. Hyg., 20: 244
7 — *anduzei* Rozeboom, 1942, Bol. Ent. Venez., 1: 91
8 — *antunesi* Coutinho, 1939, Bol. Biol., n. s., 4: 181
= *intermedia acuta* Floch e Abonnenc, 1942 ("pro parte"), Publ. Inst. Pasteur Guyane, n.º 30, p. 12
= *balourouensis* Floch e Abonnenc, 1944, Publ. Inst. Pasteur Guyane, n.º 81, p. 1
9 — *anthophora* Addis, 1944, J. Paras., 31: 122
10 — *argãoi* Costa Lima, 1932, Mem. Inst. O. Cruz, 26: 48
= *coutinhoi* Mangabeira, 1942, Mem. Inst. O. Cruz, 37: 152
11 — *arborealis* Floch e Abonnenc, 1944, Publ. Inst. Pasteur Guyane, n.º 81, p. 8
12 — *arthuri* Fonseca, 1936, Rev. Ent. 6: 324
13 — *atroclavata* Knab, 1913, Ins. Ins. Mens., 1: 135.
= *tejerae* Larrousse, 1921, Étud. Syst. Méd. Phléb. p. 71
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= *suis* Rozeboom, 1940, Amer. J. Hyg., 23 (C) : 8
= *japignyi* Floch e Abonnenc, 1944, Publ. Inst. Pasteur Guyane, n.º 83, p. 2
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85 — *inflata* Floch e Abonnenc, 1944, Publ. Inst. Pasteur Guyane, n.º 80, p. 9
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92 — *lloydi* Antunes, 1937, Rev. Biol. Hig., 8: 24
93 — *longipalpis* Lutz e Neiva, 1912, Mem. Inst. O. Cruz, 4: 90
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147 — *shannoni* Dyar, 1929, Amer. J. Hyg., 10: 121
= *limai* Fonseca, 1935, Mem. Inst. Butantan, 10: 61
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166 — *verrucarum* Townsend, 1913, Inst. Ins. Mens., 1: 107

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169 — *venezuelensis* Floch e Abonnenc, 1948, Publ. Inst. Pasteur Guyane, n.º 178, p. 1

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171 — *vindicatrix* Dampf, 1944, Rev. Soc. Mex. Hist. Nat., 5: 248

172 — *wagleyi* Causey e Damasceno, 1945, Mem. Inst. O. Cruz, 42: 26

173 — *walkeri* Newstead, 1914, Bull. Ent. Res., 5: 188

174 — *vexillaria* Fairchild e Hertig, 1952, Ann. Ent. Soc. Amer., 45: 514

175 — *wilsoni* Damasceno e Causey, 1945, Mem. Inst. O. Cruz, 42: 638

176 — *wirthi* Vargas e Diáz-Nájera, 1951, Rev. Inst. Salubr. Enferm. Trop., 12: 103.

177 — *whitmani* Antunes e Coutinho, 1939, Bol. Biol., n. s., 4: 448
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179 — *ylephiletrix* Fairchild e Hertig, 1952, Ann. Ent. Soc. Amer., 45: 518
180 — *zikani* Barretto, 1950, Folia Clin. Biol.,
181 — *zulianensis* Floch e Abonnenc, 1948, Publ. Inst. Pasteur Guyane, n.º 178, p. 5

BRUMPTOMYIA

Brumptomyia França e Parrot, 1921, Arch. Inst. Pasteur Afrique Nord, 1: 281 (*Phlebotomus*, subgen. *Brumptomyia*); tipo *Phlebotomus brumpti* Larr., 1920, designado por Dyar, 1929.

Aceito por Dyar (1929) que lhe designou o genótipo, o subgênero *Brumptomyia* foi rejeitado por Parrot (1934).

Revalidado por Theodor (1948) que o considerou bom gênero, foi novamente rejeitado por Parrot (1951) como sinônimo de *Prophlebotomus* que, como já vimos, é sinonimo de *Sergentomyia*. Argumenta Parrot (1951) que as espécies de *Brumptomyia* se aproximam, pela armadura bucal, de várias espécies paleárticas de *Prophlebotomus* e que por isto não podem ser separadas em grupo distinto. Esquece-se Parrot (1951) de outros caracteres das espécies de *Brumptomyia*. A morfologia da terminália do macho, a forma particular da nervação da asa, a presença de apenas duas cerdas caudais nas larvas em todos os estádios, etc. afastam-nas com segurança das espécies de *Sergentomyia*.

São as seguintes as espécies válidas de *Brumptomyia*:

1 — *avellari* Costa Lima, 1932, Mem. Inst. O. Cruz, 26: 48
2 — *beaupertuyi* Ortiz, 1954, Acta Biol. Venez., 1: 235
3 — *brumpti* Larrousse, 1920, Bull. Soc. Path. Exot., 13: 659
4 — *cardosoi* Barretto e Coutinho, 1941, Papéis Avulsos Depto. Zool. S. Paulo. 1: 148
5 — *cunhai* Mangabeira, 1942, Mem. Inst. O. Cruz, 37: 205
6 — *galindoi* Fairchild e Hertig, 1947, Ann. Ent. Soc. Amer., 40: 615
7 — *guimarãisi* Coutinho e Barretto, 1941, Rev. Biol. Hig., 11: 78
8 — *hamatus* Fairchild e Hertig, 1947, Ann. Ent. Soc. Amer., 40: 614
9 — *leopoldi* Rodriguez, 1953, Rev. Ecuat. Hig. Med. Trop., 10: 52
10 — *mangabeirai* Barretto e Coutinho, 1941, Papéis Avulsos Depto. Zool. S. Paulo 1: 151
11 — *nitzulescui* Costa Lima, 1932, Mem. Inst. O. Cruz, 26: 46
12 — *pentacanthus* Barretto, 1947, Papéis Avulsos Depto. Zool. S. Paulo 8: 239
13 — *pintoi* Costa Lima, 1932, Mem. Inst. O. Cruz, 26: 48
14 — *spinosipes* Floch e Abonnenc, 1943, Publ. Inst. Pasteur Guyane. n.º 61, p. 16
15 — *travassosi* Mangabeira, 1942, Mem. Inst. O. Cruz, 37: 201

WARILEYA

Warileya Fairchild e Hertig, 1948, Ann. Ent. Soc. Amer., 41: 12; tipo *W. phlebotomanica* Fairch. e Hert., 1948, por monotipia.

Trata-se de um gênero bastante característico e fàcilmente separável dos outros pelos caracteres dos machos e fêmeas. Nele se incluem as espécies seguintes:

1 — *nigrosacula* Fairchild e Hertig, 1951, Ann. Ent. Soc. Amer., 44: 428
2 — *phlebotomanica* Fairchild e Hertig, 1948, Ann. Ent. Soc. Amer., 41: 12
3 — *rotundipennis* Fairchild e Hertig, 1951, Ann. Ent. Soc. Amer., 44: 424

CHAVE PARA OS GÊNEROS DA SUBFAMÍLIA PHLEBOTOMINAE

A. *Machos*

1 -	Terminália muito grande, sendo o comprimento do gonostilo bem maior que o do tórax; dististilo com cinco espinhos grossos, retos e curtos; basistilo com um tufo de cerdas na base da face interna.	*Brumptomyia*
	Terminalia com o comprimento no máximo igual ao do tórax; quando mais longa, então o basistilo não tem tufo de cerdas ou o dististilo tem apenas quatro espinhos ...	2
2 -	Basistilo mais curto que o dististilo; asa larga, curta e arredondada no ápice	*Warileya*
	Basistilo mais longo que o dististilo; asa longa e estreita, não arredondada no ápice	*Sergentomyia*

B. *Fêmeas*

1 -	Armadura bucal ausente	*Warileya*
	Armadura bucal presente	2
2 -	Armadura bucal constituída por dentes horizontais dispostos em fileira transversal ou sôbre as paredes laterais e com as extremidades voltadas para dentro	*Sergentomyia*
	Armadura bucal constituída por dentes horizontais dispostos irregularmente no assoalho da cavidade bucal, sem formar fileira	*Brumptomyia*

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A REVIEW OF THE GENUS *MYSTROPS* ERICHSON (COLEOPTERA, NITIDULIDAE) (1)

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This paper is submitted as an aid to the identification of the species of the genus *Mystrops*. The key to the species has been prepared after examining the descriptions and the few figures that have been considered necessary by the authors as well as the supplemental remarks not only by the original author but also by the subsequent workers in the group. Except for the new species described herein, types were not available for this study.

The meager characters upon which several of the species were founded would appear in some cases to be no more than the normal variation found within any species, particularly is this true where color is used for the separation. However, before the synonymy of this group can be established it will be necessary to critically examine the variation within several species and then, in the light of this study, to examine the types upon which the various species were founded. It is hoped that this review will stimulate some worker having access to the types of Erichson, Reitter, Sharp, and Grouvelle, to monograph the genus.

For the reasons stated above I feel it necessary toinclude a full description of each species and to suggest that all separations made with the key should be confirmed by consulting these descriptions. The descriptions include not only the information in the original description but also subsequent additional remarks by the author and by other workers in the group. where the personal pronoun is used in the descriptions it refers to the author of the species concerned or if by a subsequent worker then proper credit will be given at the end of the quotation.

I am deeply indebted to Dr. Gregório Bondar for this kindness and generosity in sending to me several cotypes and many topoty-

(1) Received for publication January 28, 1955.

pes of *Mystrops palmarum* Bondar as well as specimens of several other species including a new species which I take preasure in naming for this distinguished entomologist. I wish also to thank the American Museum of Natural History for the loan of their material which included several species in this interesting genus.

Mystrops Erichson

1843 in Germar's Zeitschrift fur die Entomologie, Vol. IV, p. 235.

Labrum bilobed
Mandible tip simple
Labial palpi filiform
Abdominal segments nearly equal

With the body form of *Cercus*. HEAD elongate, more so in the males and with projecting front. ANTENNAE of the females little longer than the head, sometimes extending nearly across the prothorax; in the males elongate, sometimes as long as the body. Club three segmented. ANTENNAL GROOVES absent on the under side of the head. LABRUM prominent, deeply bilobed. MANDIBLES projecting, strong, flat, outside rounded, tip simple and acute. LOBE OF MAXILLAE elongate, straight, slender, on the inner side with a heavy beard. MAXILLARY PALPI, first segment minute; second short, barrel shaped; third cylindrical, nearly as long as second; fourth elongate as others together. MENTUM bisinuate. LABIUM; lobes of paraglossae extended in long narrow projections fringed on inner margin; palpi with first segment short, second and third fairly long, the third elongate oval, truncate, with thick short setae on the tip. PROTHORAX posteriorly nearly of the width of the elytra, this margin bisinuate with pointed often somewhat projecting back hind angles. SCUTELLUM large, triangular. ELYTRA shortened, leaving the last two segments uncovered. PROSTERNAL PROCESS extending over the mesosternum and articulated with the metasternum. ABDOMEN short, first and last segments a little wider than the middle three. MALES without visible supplemental segment. LEGS strong; tibiae unarmed, with small spurs; tarsi, first three segments short and dilated, with long pads of pubescence beneath, fourth minute, fifth of length of others together, claws strong and simple.

KEY TO THE SPECIES OF *MYSTROPS*

1 -	Antennae of male fringed with long hairs	2.
	Antennae of male not fringed	3.
2 -	Pygidium of female deeply bilobed; tip sinuate in the male	*bondari* Gillogly
	Pygidium of female not bilobed	*heterocera* Sharp

3 -	Elytra long in both sexes, those of female attenuate (antennae nearly of body length)	*discoidea* Murray
	Elytra truncate, separately rounded	4.
4 -	Dorsum glabrous	5.
	Dorsum pubescent	6.
5 -	Antennae of male not reaching base of elytra ..	*fryi* Grouvelle
	Antennae of male reaching one-half body length	*adusta* Murray
6 -	Finely closely punctate, finely pubescent; first joint of antennal club short; thorax greatly narrowed anteriorly, hind angles rendered indistinct by long ciliae; elytra elongate (described from a single female)	*teapensis* Sharp
	Not as above	7.
7 -	Antennae of male reaching to elytra	8.
	Antennae of male one-half body length	9.
8 -	Elytra separtely bluntly rounded, depressed; pitchy black (described from a single female, male antennae may be long)	*basalis* Erichson
	Elytra sutural angles rectangular; moderately convex; pale testaceous	*debilis* Erichson
9 -	Color black	10.
	Color testaceous	11.
10 -	Short; first segment of antennal club shorter than second; body strongly punctate	*dura* Erichson
	Oblong; first segment of club as long as second and third together; body sparsely punctate (alutaceous; epistome depressed)	*dufaui* Grouvelle
11 -	Front strongly depressed; upper edge of mandibles elevated	*rotundula* Sharp
	Front not depressed; edge of mandibles not raised	12.
12 -	Prothorax anterior margin much narrower than base; antenall club oblong	*insularis* Grouvelle
	Prothorax anterior margin about equal to base; antennal club short	13.
13 -	First antennal segment thick and short; posterior angles of prothorax obtuse	*mexicana* Reitter
	First antennal segment slender; posterior angles of prothorax rectangular	*flavicans* Murray

Mystrops adusta Murray

1864 Transactions of the Linnean Society of London, Vol. XXIV, p. 414.

Very like a *Brachypterus*. Oblong, smooth, glabrous, shining, faintly punctate, piceous black, with the disk of the elytra reddish black. Head very much hollowed out in front in the middle and on each side at the base of the antennae. Epistome quadrangular and impunctate, but impressed on each side. Mandibles testaceous and much flattened. Antennae of males about half the length of the body, with the articles gradually slightly increasing in size from the third to the termination; first article stout; second to sixth elongate, equal in length; seventh and eighth shorter; ninth, tenth, and eleventh a little thickened, forming a long slender club; eleventh minute; the last six articles (sixth to eleventh) fuscous, the remainder testaceous. In the female the antennae are shorter, being scarcely longer than the thorax. Thorax transverse, moderately convex, shorter than wide, rather narrower in front than behind, expanded backwards near the posterior angles, embracing the shoulders of the elytra as it were; anterior angles obtuse; the sides angled behind the middle. Scutellum rather large. Elytra oblong, rufo-piceous, each with the disk surrounded by blackish pitchy; sides somewhat rounded and inflexed; a faint line impressed on each side of the suture, which is blackish piceous; the apex truncate and rounded. Pygidium and penultimate segment of the abdomen subpubescent, the latter scarcely visible from above, the abdomen being bent in. The underside and legs piceous.

Habitat: Colombia. In the British Museum.

Length: 2 mm. Width 1 mm.

Mystrops basalis Erichson

1873 Verhandlungen des Naturforschenden Vereines in Brünn, Vol. XII, Part I, pp. 168-169.

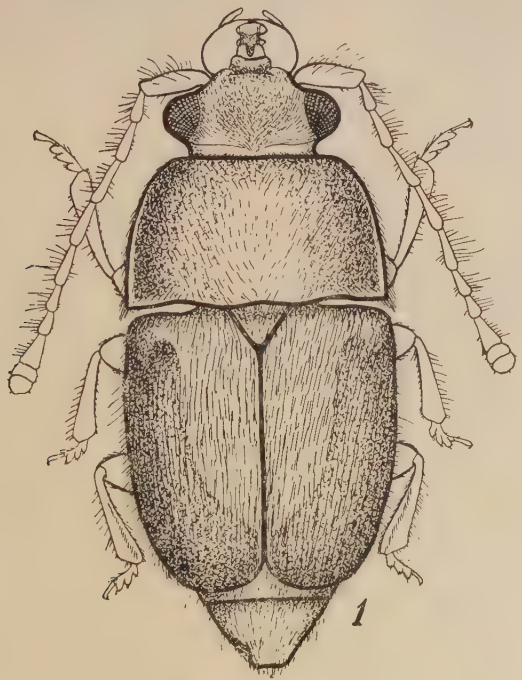
Size of *M. discoidea* but densely finely punctate; testaceous, back of head and disc of thorax pitchy black; scutellum testaceous; base of elytra more or less pitchy black; apex truncate, separately rounded; antennae as long as head and thorax, yellow, club black. I know only a female of this species, which differs from *M. discoideus* in the following: Antennae are longer, they reach the hind margin of the prothorax. Front black. Mandibles projecting, laterally dilated. Prothorax somewhat shorter. Elytra on the tip not attenuated in a point but separately bluntly rounded. Differing certainly from *M. debilis* by means of the remarkable coloring.

Habitat: Brasil. In the collection of Chevrolat.

Length: nearly 3 mm.

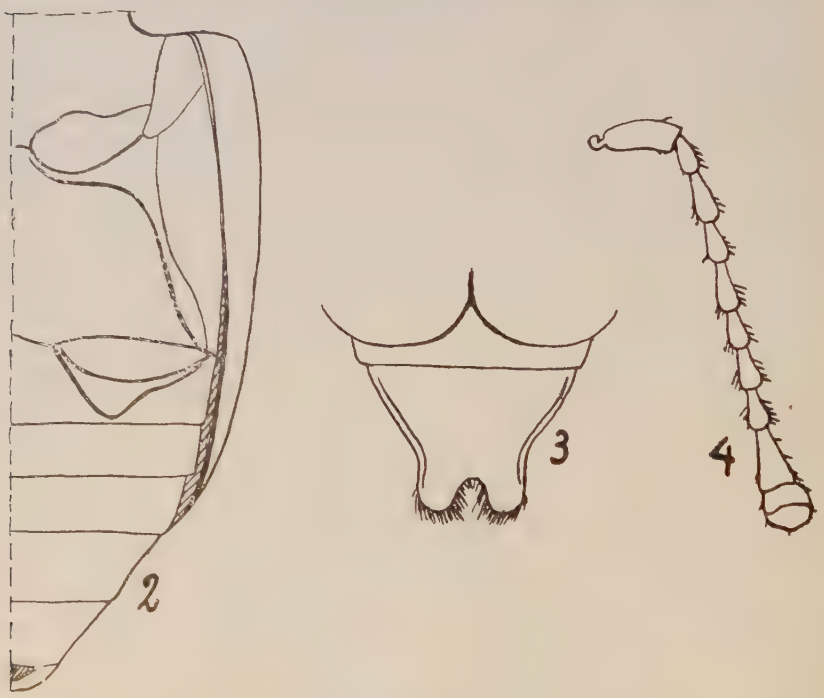
Mystrops bondari, n. sp.

Oblong-oval, moderately depressed, opaque by reason of dense covering of long pale pubescence, testaceous with piceous markings. Head, transverse, densely, closely, rather finely punctate. Eyes finely faceted, prominent, inner margins curved. Labrum very deeply bilobed, indentation reaching almost to base, lobes evently rounded, heavily bearded, the ciliae extending half way down the outside margins. Mandibles strongly dilated, tip sharp, two smaller teeth on inner margin behind the tip, molar area small and finely toothed. Maxillae; lacinia broad with very long thick beard; palpus linear, first segment short and cylindrical, second three times as long as first, clavate, third as long as second, cylindrical, fourth linear, a little longer than the first three together. Labium, lobes of paraglossae extended by long narrow projections which are fringed on the inner margin by long ciliae. Antennae of males reaching half the length of elytra; in the females, attaining the base of the elytra; male antennae covered with long, pale, erect setae; first segment cylindrical, as large as club, segments two to six nearly equal, seven and eight shorter, nine long and triangular, ten and



Mystrops bondari, n. sp.
Fig. 1 - Adult male.

eleven transverse, nine to eleven forming and oblong club. Prothorax with width to length as 1.6 to 1, anterior margin nearly straight, anterior angles evenly rounded, posterior angles rectangular, widest at posterior angles, narrowing anteriorly, sides fimbriate, the ciliae particularly long toward the posterior angles making these appear to project backwards, base sinuate on each side near angles, color



Mystrops bondari, n. sp.
Fig. 2 - Adult male ventral view; Fig. 3 - Female pygidium dorsal view; Fig. 4 - Antenna of female; (1-4 are drawn to the same scale);

varies from testaceous to piceous with intermediate forms in which the disc is testaceous and the sides piceous. Scutellum triangular, testaceous. Elytra as long as wide together, sides evenly arcuate, side margins fimbriate, tips separately rounded; color, base and disc testaceous, sides and tips piceous. Pygidium of males triangular, truncate on tip which is slightly emarginate; of females, attenuate, tip deeply bilobed. Prosternum surface alutaceous, sparsely coarsely punctate. Axillary space of metasternum, large, triangular, the line extending from the inner margin of the meso-coxae in an even curve meeting the episternal suture almost at its juncture with the meta-coxae. Post coxal line on first abdominal segment

Mystrops bondari, n. sp.
Fig. 5 - Mandible; Fig. 6 - Maxilla.

Mystrops bondari, n. sp.
Fig. 7 - Mentum, ligula, labial palpi; Fig. 8 - Labrum.

diverging from inner margin of metacoxae, extending across four-fifths of the width of the segment and recurving to coxae to form a wide blunt triangle. Legs and venter testaceous.

Habitat: Bahia, Brasil, G. Bondar collector. Rio Vermelho, Santa Catarina, Brasil, A. Maller collector.

Length: 3 mm.

This description is based on a series of twenty-eight specimens. Holotype and allotype: Estado da Bahia, Brazil, B-40, G. Bondar leg. Collected from the male flowers of the palm *Cocos zomanzoffiana* Chamille.

Types will be deposited in the collection of the Instituto Biológico, São Paulo, Brasil. Paratypes: Twenty-one with data the same as holotype and allotype; five labeled, Rio Vermelho, S. Cat., Brasil, I-1945, A. Maller. Coll., Frank Johnson Donor. Paratypes will be deposited with the Instituto Biológico, American Museum of Natural History, California Academy of Sciences, and in the author's collection. The slide mount of the mouthparts will be retained in the author's collection.

I take pleasure in naming this beetle after Dr. Gregório Bondar whose generosity and kindness in sending specimens to me representing several species in this genus stimulated my interest in this group.

Mystrops debilis Erichson

1843 in Germar's Zeitschrift fur die Entomologie, Vol. IV, p. 235.

Oblong, moderately depressed, pale testaceous, closely punctate, finely grayish pubescent. Antennae equal in both sexes, about the length of the head and thorax; first article not very long; rather stout; second, third, and fourth somewhat longer; fifth, sixth, seventh, and eighth rather shorter; the ninth elongate, and the club composed apparently of only two articles. Head impressed on each side in front with a small pit. Thorax transverse, slightly narrower in front; base bisinuate; anterior angles obtusely rounded; posterior angles somewhat projecting backwards; disk longitudinally piceous. Scutellum moderate. Elytra long and subparallel, once and a half the length of the thorax, sides declinate, rounded, margined; apex truncate; exterior apical angles broadly rounded; sutural apical angles subrectangular, rounded at the point.

Habitat: Brasil, Caasapava. Collected by Sellow.

Length: 3 mm.

Mystrops discoidea Murray

1864 Transactions of the Linnean Society of London, Vol. XXIV, p. 412.

"Very like *M. dura,* but not so convex nor so deeply punctate; the elytra longer in both sexes, and pointed in the female. The antennae have the club composed apparently of only two articles, and the sixth, seventh, eighth, and ninth are not shorter than those preceding as in *M. dura.* The colour is usually testaceous, with the disk piceous; but it varies considerably, chiefly in the extent occupied by the piceous portion; sometimes it is nearly of the colour of the males of *M. dura,* the elytra being almost entirely piceous; but I have never seen them wholly so, the apex being always more or less testaceous. Nor have I seen the scutellum piceous; it seems to be always testaceous in this species; in *M. dura* piceous. I have a specimen entirely rufous.

"From the banks of the Amazons. It appears to be not very rare about Ega, where Mr. Bates procured a good many specimens."

Habitat: Amazon River.

Length: 3 to 4 mm. Width 1.6 mm.

Mystrops dufaui Grouvelle

1912 Annales de la Société Entomologique de France, Vol. LXXXI, pp. 290-291.

Nearly oblong, a little more than twice as long as the greatest width, convex, little shining, covered with a fine, short, yellow, close-lying, fairly dense pubescence, dull black. Antennae and feet testaceous. Head reddish with the front a little darker. Prothorax side margins fairly widely reddish becoming progressively darker toward the discal black portion. ANTENNAE of the male fairly long, first article dilated, strongly arcuate, two and one-half times as long as wide, as long as second and third together, second a little less dilated, one and one-half times longer than wide, third to eighth becoming progressively thickened, third slender, about equal to sixth, seventh, and eighth, fourth and fifth a little longer than third, ninth to eleventh forming a slightly dilated club, of which the first article forms a truncated reversed cone, a little longer than the other two together and noticeably more than twice as long as the eighth article of the antennae. HEAD triangular, nearly as long as wide at the level of the eyes, narrowed in front of the insertion of the antennae, shortly nearly parallel on the sides of the epistome, truncate in front. EPISTOME depressed, finely alutaceous, sparsely punctate. LABRUM projecting, very deeply notched. EYES little prominent, their inner margins converging. PROTHORAX of the width of the head in front, nearly twice as wide at the base, arcuate on the sides, a little

more than twice as wide at the base as long, finely alutaceous, sparsely punctate; anterior margin truncate; anterior angles seen from beneath bluntly obtuse, viewed from the other side obtuse; sides very finely margined; posterior angles acute, projecting a little posteriorly; base truncate, arcuate toward the angles. SCUTELLUM triangular, less wide at the base than one-third the width of the base of the prothorax, width of base nearly twice length, finely alutaceous, sparsely punctate. ELYTRA about as wide at the base as the prothorax, the angle of the humerus obtuse when seen from below, arcuate on the sides, feebly widened, external apical angles rounded, widely separately rounded on the tip, a little longer than wide together at their greatest width, slightly visibly alutaceous, finely punctate, but a little more strongly than the head, sutural striae nearly entire, marginal striae definite, margin narrow. AXILLARY SPACE of the metasternum diverging slowly from the mesocoxae, bending near the episternal suture and joining it at near half its length.

Habitat: La Soufrière, Guadeloupe (altitude 1400 m.), two specimens of males from a clump of *Sphagnum* by umbrella. A. Grouvelle collector.

Mystrops dura Erichson

1843 in Germar's Zeitschrift fur die Entomologie, Vol. IV, p. 235.

Short, convex, somewhat shining, closely punctate, black mouth and sides of head reddish, antennae (except club) and tarsi testaceous. Head, thorax, and abdomen with grayish pubescence; scutellum and elytra blackish pubescent. MALE ANTENNAE slender and nearly as long as body, first article stout and elongate, second, third, and fourth longer and nearly equal to each other in length, fifth a little longer, sixth, seventh, and eighth shorter and decreasing by degrees becoming crescent shaped, club oblong and moderately flattened. FEMALE ANTENNAE reaching to the base of the thorax, first article long, second, third, fourth, and fifth about equal, oblong, sixth, seventh, and eighth subglobose, club as in male. THORAX narrowed in front, sides reddish or sometimes concolorous. ELYTRA rather short, apex of each rounded in both male and female. Abdomen punctulate. Legs testaceous.

The males have the thorax with the sides testaceous and the disc piceous. The females are entirely black. The color generally is darker in the female, the dark color in the male being pitchy black and that of the female black or nearly so. The female has the apex of the elytra rounded like the male and not peaked as in *M. discoidea*.

Habitat: Brasil.

Length: 3.5 mm.

Mystrops flavicans Murray

1864 Transactions of the Linnean Society of London, Vol. IV, p. 235.

Allied to *M. debilis* but only half the size, of a soft and delicate texture, testaceous, very slightly pubescent, oblong, somewhat depressed. HEAD with a deep transverse and oblique impression on each side in front. ANTENNAE abouth half the length of the body, slender, with the articles as in *M. discoidea* but with a smaller and shorter club. THORAX not much narrower in front than behind, impressed on each side in the middle, with the anterior angles inflexed and rounded, the posterior almost flat right angles, truncate at the base. SCUTELLUM triangular. ELYTRA nearly parallel, with the sides inflexed and rounded, a faint line impressed on each side of the suture, the apex truncate and its outer angles rounded.

Habitat: Brasil. In British Museum.

Length: 1.6 to 2 mm. Width: 0.8 mm.

Mystrops fryi Grouvelle

1898 Annales de la Societe Entomologique de France, Vol. LXVII, p. 352.
M. palmarum Bondar, 1940, Revista de Entomologia, Vol. XI, Fasc. 1-2, pp. 212-214.

Oblong, moderately convex, glabrous, testaceous; head and prothorax reddish testaceous. ANTENNAE of male nearly reaching base of prothorax, first article dilated, clubbed, recurved, second to fourth a little longer than wide; female antennae shorter. HEAD more shining than elytra, sparsely punctate, line between antennae not reaching the inner margin of the eyes, longitudinal stria on the front of the male finely marked. MANDIBLES of the male projecting. LABRUM deeply bilobed. EPISTOME convex. PROTHORAX more than twice as wide as long, narrowed to both base and tip, sparsely punctate, anterior margin nearly straight, lateral margins and base finely margined, anterior angles rounded, posterior angles obtuse, disc often reddish brown. SCUTELLUM triangular, finely reticulate, sparsely punctate, sometimes darker. ELYTRA oval, sutural striae moderately deep, as wide as prothorax, nearly as long as wide together, finely punctate, truncate on tip leaving last abdominal segment uncovered.

Bondar gives a discussion of the biology of this species and reports the adults and larvae as attacking and destroying the male flowers of *Cocos coronata* Mart. (licuriseiro) and *Cocos nucifera* (coconut).

Habitat: Bahia, Brasil. In the collection of A. Grouvelle.

Length: 2-2½ mm.

Mystrops heterocera Sharp

1898 Biologia Centrali Americana, Coleoptera, Vol. II, Part 1, p. 268.

Of very short form, pubescent, reddish, with obsolete punctation which is quite distinct in the male, but closer in the female. Antennae are longer and stouter in the male than they are in the female, and differ from those of the other species of the genus inasmuch as the club is three jointed and of normal form; in the male they bear a fringe of long erect hairs. HEAD very short, very obsoletely impressed in front. THORAX transverse, nearly straight at the sides, hind angles nearly rectangular, front angles obtuse and indistinct. ELYTRA elongate, leaving only the pygidium exposed, testaceous, darkened near the scutellum. PROSTERNAL PROCESS narrow, elevated along the middle, not bent upwards behind the coxae. Abdominal segments two, three, and four short, of equal length. Male without supplementary segment.

Habitat: Senahu, Guatemala. Collected by Champion.

Length: 1.5 mm.

Mystrops insularis Grouvelle

1898 Annales de la Societe Entomologique de France, Vol. LXVII, pp. 352-353.

Oblong, slightly convex, little shining, testaceous, covered with a short somewhat serial, yellow golden pubescence. HEAD fairly convex, transverse impression between the bases of the antennae. ANTENNAE of male with articles one to six much longer than wide, club oblong, the articles compact, complete antenna reaching one half the body length; female antennae attaining base of prothorax. MANDIBLES pointed. PROTHORAX nearly two times as wide as long, narrowed anteriorly, arcuate on the sides, a little straighter toward the base, anterior angles rounded, posterior angles obtuse, punctation very fine, intervals between punctures finely reticulate. SCUTELLUM triangular. ELYTRA a little longer than wide together, truncate on the apex, very little visibly punctate and reticulate.

Habitat: Trinité, Martinique, West Indies.

Length: 1.5 mm.

Mystrops mexicana (Reitter)

Priops mexicanus Reitter, 1873 Verhandlungen des Naturforschenden Vereines in Brunn, Vol. XII, Part I, pp. 168-169.

Oblong, lightly convex, pale yellow, fine, thick, short, gray pubescence, obsoletely punctate. EYES large, prominent. HEAD extremely finely punctate, feebly transversely impressed in front.

Thorax strongly transverse, the sides slightly narrowed in front, very little curved, truncate in front, hind angles rather obtuse, but rendered apparently more rectangular by a minute ciliation, front angles quite as distinct as the hind, slightly obtuse but a little rounded. Elytra elongate, twice as long as prothorax, truncate at the extremity in the female, slightly more rounded in the male.

"We have received a small series of this species showing that the male varies greatly as regards the development of the antennae; in some examples they are as long as the body, in others only about half as long; in the female they are short, and in this sex the first joint of the club is nearly as long as broad, and nearly conical in one of its outlines. The species is no doubt closely allied to *M. flavicans,* Murray but that insect is represented as having a rather slender, long basal joint to the antennae, whereas in *M. mexicana* this joint is much thickened, and not very long in even the largest males.

"Reitter's description was made from a specimen in the Imperial Museum at Vienna, and our figure of the male is taken from this individual. Our figure of the female is taken from a Panama example; and I am informed by Herr Schlereth, to whon I sent specimens of both sexes of the series from Panama, there is no doubt that these examples are of the same species as the Mexican type: this I understand is also the opinion of Herr Reitter himself." quoted from Sharp in Biologia Centrali Americana.

Habitat: Tacubaya, Mexico; Volcan de Chiriqui, Panama.
Length: 1.75-2.5 mm.

Mystrops rotundula Sharp

1898 Biologia Centrali Americana, Coleoptera, Vol. II, Part 1, pp. 266-267.

Short, convex, shiny, sparsely pubescent, testaceous, elytra near scutellum blackish. Head concave in front. Eyes hemispherical. Antennae very long, stout, first joint incrassate, a little concave above, joints two to eight nearly similar to one another, each thicker at the extremity, ninth joint longer but similar in form, tenth and eleventh quite short and not broader.. Manlibles upper edge elevated. Thorax strongly transverse, sparingly and not very finely punctured, all the angles minutely prominent. Elytra of a more pallid yellow color, but infuscate about the scutellum, rather sparingly and coarsely punctate. The exposed parts of the abdomen quite short.

We have received three examples of this very distinct species. One of them has the antennae much shorter, but I have no doubt they are all males. There is no supplementary apical segment. The prosternal process is margined, dilated, and a good deal prolonged

58
T. B. Blue. (P.C.)

behind the coxae, a little curved upwards. The structure of the mandibles is very peculiar, and, conjoined with the depressed front of the head, makes the species very easy of recognition.

Habitat: Volcan de Chiriqui, Panama. (2400 to 6000 feet).

Length: 2 mm. Width: 1.25 mm.

Mystrops teapensis Sharp

1898 Biologia Centrali Americana, Coleoptera, Vol. II, Part 1, p. 267.

Oblong-oval, convex, finely pubescent, finely closely punctate, sub-opaque, testaceous, antennal club and venter darker. FEMALE: Antennae reaching not quite to the back of the thorax, first joint of club short, not much longer than the second. HEAD scarcely impressed in front, finely but distinctly punctate. THORAX convex, a good deal narrowed in front, anterior angles obtuse, the hind angles rendered indistinct by long ciliae, surface finely but distinctly, moderately closely punctate. Elytra elongate, quite as finely and scarcely so closely punctate as the thorax, leaving two dorsal segments exposed.

We have received one specimen only of this species, but as it is quite distinct from any other, and marks the most northern extension of this interesting genus, I have described it without hesitation. I have an allied undescribed species from the valley of the Amazons in my collection.

Habitat: Teapa, Tabasco, Mexico. H. H. Smith collector.

Length: 2.25 mm.